Towards the effective introduction of physical activity interventions in primary health care
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Factors associated with physical therapists' implementation of physical activity interventions in the Netherlands

Abstract

Background
Physical therapists can play an important role in physical activity (PA) promotion and the effectiveness of PA interventions. However, little is known on how they implement PA interventions and the factors that may influence their implementation behaviors.

Objective
The present study aimed to investigate physical therapists' PA intervention implementation fidelity, including completeness and quality of delivery, and potential influencing factors using a Theoretical Domains Framework (TDF)-based questionnaire.

Design
The study was based on a cross-sectional design.

Methods
The final analyses included 268 physical therapists who completed the Determinants of Implementation Behavior Questionnaire. Questions on completeness and quality of delivery were based on PA intervention components and tasks described by the Royal Dutch Society for Physical Therapy. Multilevel regression analyses were conducted to identify factors associated with completeness and quality.

Results
Physical therapists reported high implementation fidelity with higher completeness compared to quality of delivery. Analyses revealed that physical therapists' knowledge, skills, beliefs about capabilities and consequences, positive emotions, behavioral regulation, and the automaticity of PA intervention delivery were most important predictors of implementation fidelity. Results indicated that the TDF domains together accounted for 23% ($p < .001$) of the variance in both total completeness and quality scores.

Limitations
Our study was cross-sectional, so we could not determine any causal relationships. Furthermore, we used a self-report measure to assess implementation fidelity, which due to a possible social desirable response could have led to more favorable ratings of completeness and quality.

Conclusions
This study enhances our understanding of how physical therapists implement PA interventions and which factors may influence their behaviors. Knowledge on these factors can inform the development of strategies to improve physical therapists' implementation behaviors.

7

Introduction

Although physical activity (PA) is well-known to play an important role in disease prevention, health promotion and quality of life [206–208], many people are not sufficiently active [209]. In the Netherlands, 40% of the of the adults between 18 and 65 years of age fail to achieve the national recommendation of at least 30 minutes of moderately intense PA, on at least five days a week [210–212]. Moreover, half of the people with a chronic disease do not meet this norm [212]. Primary health care (PHC) is an ideal setting to promote PA in the general population [116,213]. The majority of adults visits a PHC professional at least once a year [213] and PHC professionals perceive PA promotion as important and part of their role [65]. Furthermore PHC-based PA interventions, such as PA counseling, prescribing PA, and referral to a PA training program, have been shown to be successful in increasing PA, at least with regard to the short term [60–63].

The public health impact of efficacious PHC-based PA interventions is, however, strongly dependent on how they are implemented in practice [7,16,19]. Implementation fidelity refers to the extent to which an intervention is delivered as intended (also known as adherence, compliance, integrity) [16,21], including both the quantity or completeness (i.e., how much of the intervention components are delivered) [16,21,127,214] and quality of the delivery (i.e., how well intervention components are delivered) [12,16,21,127]. In addition, other described aspects of implementation fidelity include participant responsiveness and program differentiation [16,21]. Although many studies have reported on the efficacy of PHC-based PA interventions, relatively little attention has been paid as yet to PHC professionals' implementation of these evidence-based interventions in practice [12,58]. Investigating PHC professionals' implementation behaviors is important, because the extent to which interventions are delivered as intended can moderate the relationship between interventions and their intended outcomes [16]. Therefore, implementation research is likely to enhance accurate interpretation of intervention outcomes [16,21]; in other words, it can provide information on why interventions are effective or not [6].

Due to their training and experience, physical therapists are PHC professionals who can play an important role in PA promotion, and through implementation fidelity they have a strong potential to increase the effectiveness of PA interventions [55,116,215]. Moreover, they are an important group of health care professionals delivering PA interventions in Dutch PHC. During the past two decades evidence-based practice has become of major importance in physical therapy [216,217]. This has led to the development of clinical practice guidelines by the Royal Dutch Society for Physical Therapy (KNGF) regarding physical therapy for people with a variety of conditions [218,219] (for an overview of KNGF guidelines see the KNGF website [220]). Furthermore, the KNGF has developed protocols for PA interventions, which inform physical therapists on PA interventions' core components (i.e., intake, training program, evaluation, attention to maintenance of PA, and contact with referring professional) and their underlying tasks (e.g., determine goals, set up training program with right content and intensity) (KNGF protocols for PA interventions are available in Dutch, for an overview see the KNGF website [221]). Many of the PA interventions delivered by physical therapists in Dutch PHC are based on these protocols.

Despite the promising findings related to the efficacy of PHC-based PA interventions [60–63], PA interventions are quite frequently not delivered as intended by the intervention developers [53,54]. Furthermore, research has indicated that physical therapists' evidence-based practices can be

improved [55–57,217]. This might be partially caused by the complexity of the behaviors involved in providing patient care and delivering behavior change interventions (e.g., PA interventions), and the many different potential determinants of such behaviors, including factors related to the innovation, social setting, organizational context, innovation strategies, patient, and the intervention provider [7,17,24,27]. Indeed, qualitative studies identified similar factors to be important for PHC professionals' implementation of PA interventions in general [131] and physical therapists' delivery of evidence-based physical therapy in specific [203]. However, there is limited data on physical therapists' implementation of PA interventions and the factors that influence their behaviors. Knowledge on how physical therapists deliver PA interventions and influencing factors is however a necessary prerequisite for the development of effective strategies to enhance physical therapists' implementation behaviors [6,7,35–38].

Given the range of potential factors associated with health care professionals' implementation behaviors, many advocate the use of theory to guide the selection of factors to investigate [6,22,36,43,145]. First, there is quite some evidence that behavior change interventions that are based on theory are likely to be more effective than those that are not [32,36,39,222], which might also hold true for interventions aimed at changing health care professionals' implementation behavior, i.e., implementation strategies. Second, by assessing the importance of theory-based factors, theoretical constructs can be identified that impact patterns of care and therefore may be targeted by implementation strategies [6,35,36]. However, the heterogeneity of theories and frameworks that guide implementation research have led to some challenges in measuring theory-based factors underlying health care professional behavior [22,32,64,145]. The Theoretical Domain Framework [30,31] (TDF) is an integrative framework of constructs from behavior change theories that can be used to develop a measurement instrument able to assess determinants of health care professionals' implementation of behavior change interventions [46,47]. In this way, the TDF can be used to identify suitable theories to further investigate specific implementation behaviors [182]. Furthermore, it links influencing factors to techniques of behavior change which can be used in implementation strategies [30,35]. Huijg et al. [173] developed a TDF-based questionnaire to assess potential behavioral determinants in a theory-based way. In a first investigation of its psychometric properties, the Determinants of Implementation Behavior Questionnaire (DIBQ) was suggested to have acceptable construct validity (based on confirmatory factor analysis) and the majority of the TDF domains appeared to be reliably and discriminately measurable [173].

The present study aimed to investigate the extent to which physical therapists deliver PA interventions with high fidelity (i.e., following the intervention protocol) and which TDF domains [31] are associated with completeness and quality of delivery. Research questions were as follows: 1. to what extent do physical therapists deliver all PA intervention components to all of their patients (i.e., completeness), 2. how well do they deliver PA interventions (i.e., quality), and 3. which TDF domains are associated with physical therapists' completeness and quality of delivery?

Methods

Design and respondents
The study was a cross-sectional questionnaire study conducted through the Internet by the use of

Qualtrics Software, version 45433 [132]. Recruitment and data collection took place from June 2012 until March 2013. We recruited physical therapists delivering PA interventions to a variety of target groups (i.e., people with chronic obstructive pulmonary disease, diabetes, arthritis or obesity) to be able to examine the association between TDF domains and the implementation of PA interventions in general. Interventions were similar with regard to their core components (i.e., intake, training program, evaluation, attention to maintenance of PA, and contact with referring professional), that were to a small or greater extent based on KNGF protocols for PA interventions [221].

The first strategy to recruit physical therapists was contacting their associations and collaborations in the Netherlands. These associations and collaborations invest time and effort in the implementation of PA interventions by, for example, developing PA intervention protocols, providing training, and organizing meetings. When they were willing to participate in the study, a questionnaire was developed specifically on the implementation of the PA intervention they chose to be evaluated. Subsequently, member physical therapists were sent an email including the link to the online questionnaire and were assured that their responses would be confidential and anonymous. Physical therapists were eligible for participation if they had experience with and were currently delivering one of the PA interventions that were under study and if they were working in PHC. Completing the questionnaires indicated consent, so no separate consent was obtained. Individual physical therapists were rewarded a 25 euro voucher for participating. Associations and collaborations were provided with a summary of the results. A second recruitment strategy was to identify physical therapists delivering PA interventions through the internet and practice websites. These physical therapists were contacted by phone and/or email to invite them for the study. When they were willing to participate in the study, they were sent an email including the link to the online questionnaire. After one, two, and three weeks non-respondents received a reminder and at the end of the study, non-respondents were sent an email with a questionnaire on their demographic characteristics and reasons not to participate in the study.

Measurement

Demographic characteristics

Respondents and non-respondents reported their gender, age, practice/workplace, and socioeconomic status (SES) of the majority of their intervention participants. Practice experience was reported in years. Experience with PA interventions was measured differently for the first part of respondents compared to the second part of respondents and the non-respondents. Initially, we asked how many patients physical therapists delivered the intervention to in total. Later on, we asked how many patients physical therapists delivered the intervention to in the past two years. This change in measurement was based on respondents' comments that it was difficult to report the total amount of participants they delivered the intervention to. Therefore, median scores were calculated for experience with PA intervention. Scores below median indicated short experience and median scores and higher indicated long experience.

Implementation fidelity

Physical therapists' implementation fidelity of PA interventions, including completeness and quality of delivery, was assessed using a self-report questionnaire. Content of the questionnaire was based on the core components of PA interventions (i.e., intake, training program, evaluation, attention to maintenance of PA, and contact with referring professional) and their underlying tasks (Appendix 1).

Completeness of delivery was assessed by asking physical therapists with how many of the intervention participants they performed a certain task. Therefore, completeness of the different intervention components was assessed by multiple items. On average, intake completeness was measured with 12 items, training program completeness with nine items, evaluation completeness with five items, and attention to maintenance of PA completeness and contact with the referring professional completeness with two items each. An example question was: 'With how many of the participants did you determine PA intervention goals?'. Responses were assessed on a 7-point Likert scale (1 = none, 2 = a few, 3 = less than half, 4 = half, 5 = more than half, 6 = almost all, and 7 = all). For each respondent, a total completeness score was calculated based on mean scores of all completeness items, in addition to mean completeness scores for each intervention component. PA intervention protocols were used to tailor completeness items to specific PA interventions concerning chronic obstructive pulmonary disease (COPD), diabetes, arthritis, or obesity. This resulted in questionnaires that were similar for all physical therapists with regard to the intervention components and tasks, but questionnaires differed slightly for the various PA interventions with regard to the assessment of completeness at item level. For instance, questionnaires assessing completeness of interventions aimed at promoting PA in people with COPD included assessing patients' breathlessness score, whereas this was not included in diabetes, arthritis, or obesity questionnaires. Furthermore, physical therapists' measurement of waist circumference was included in questionnaires on diabetes and obesity PA interventions, whereas this task was not included in the other questionnaires.

Quality of delivery was assessed by asking physical therapists' satisfaction with their delivery of a specific intervention component (i.e., intake, training program, evaluation, attention to maintenance of PA, and contact with referring professional). Therefore, quality was assessed by five items in total. An example question was: 'How satisfied are you with how you did the intake?'. Responses were assessed on a 7-point Likert scale (1 = not satisfied at all, 2 = a little dissatisfied, 3 = not satisfied/ not dissatisfied, 4 = a little satisfied, 5 = satisfied, 6 = very satisfied, and 7 = totally satisfied). For each respondent, a total quality of delivery score was calculated based on the mean scores of all quality items.

TDF domains

The Determinants of Implementation Behavior Questionnaire (DIBQ; Huijg et al. [173]; Appendix 2) was used to assess potential factors influencing physical therapists' completeness and quality of delivery of PA interventions. This part of the questionnaire was similar for all participants, because physical therapists' implementation behaviors were referred to as 'delivery of [PA intervention] following the intervention protocol'. This allowed us to assess one general behavior in relation to each domain instead of all different tasks involved in delivering PA interventions. To remind respondents about what this general behavior included for them, they were presented with the tasks that they were required to perform if they were to deliver the specific PA intervention they were working with following the intervention protocol. An example question is: 'I am confident that I can deliver [PA intervention] following the intervention protocol'. Responses were assessed on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Mean scores were calculated for each of the 18 domains. For the domains *Organization* and *Social influences* it was possible to fill in 'Not applicable' for some of the items. These scores were recorded as missing. To calculate the mean of the specific domains, items with missing values were imputed for each respondent separately with the respondents' mean of the remaining items.

The questionnaire was piloted among five colleague researchers and a sample of physical therapists (n = 8). Piloting indicated that the questionnaire was understood and received well by the respondents. Questions on the implementation of specific PA interventions were discussed with physical therapists who had experience with its delivery.

Data analyses
The target sample size was based on a recommendation by Stevens et al. [168] to have a minimum of 270 respondents when undertaking multiple regression analysis with 18 predictors.

Questionnaires were exported from Qualtrics [132] to IBM SPSS Statistics 19.0 [136] for analyses. Differences in demographic characteristics between respondents and non-respondents were analyzed with chi-square tests for categorical variables and independent t-tests for continuous variables. Associations between domains were assessed using Pearson's correlation and defined as small (.10), medium (.30), and large (.50), according to the guidelines of Cohen [196]. Intraclass correlations were calculated to assess the proportion of the total variability in the outcome that was attributed to the different PA interventions. Multilevel regression analyses [223] were performed to explore the association between the 18 domains of potential behavioral determinants and self-reported completeness and quality of delivery. These analyses take into account the non-independence of physical therapist scores (level 1) nested within the different PA interventions they deliver (level 2). Multilevel analyses were performed for each of the 18 predictor variables separately, i.e., to assess univariate associations, followed by analyses including all predictor variables, i.e., to assess multivariate associations. Total completeness and quality scores were treated as outcome variables. The false discovery rate controlling procedure [162] was used to correct for multiple testing. The proportion of variance explained at the first level was calculated as the decrease in residual variance from the intercept-only model to the model of interest (see formula 4.8 in Hox [223], p. 71, based on Raudenbush & Byrk [224]).

Results

Characteristics of the respondents
Of the 496 physical therapists who were invited for the study, 274 (55.2%) delivering 15 different PA interventions completed the questionnaire. From the 274 questionnaires, 268 were used in the analysis. Reasons for removal were: no experience with PA intervention delivery (n = 4) and non-reliable completeness and quality scores (n = 2). Table 1 shows characteristics of the respondents and non-respondents. Of the respondents, 58.2% (n = 156) was female, they were on average 39.8 (SD = 12.3) years old, and they had on average 15.0 (SD = 11.3) years of practice experience. Most of the respondents worked in a group practice (68.3%, n = 183) and most delivered PA interventions to an equal percentage of intervention participants with a low and high SES (52.6%, n = 141) or specifically to intervention participants with a low SES (45.1%, n = 121). None of the demographic variables correlated significantly with total completeness and quality scores (data not shown).

Sixty-eight out of 222 non-respondents (30.6%) completed the non-respondents questionnaire. Comparisons between respondents and non-respondents indicated that the latter were significantly older and had more practice experience. Main reasons for not filling out the

questionnaire were lack of experience with the specific PA intervention the questionnaire was about (*n* = 26), lack of experience with delivering the PA intervention because of a lack of PA intervention participants (*n* = 33), and lack of time to fill out the questionnaire (*n* = 16).

Table 1. Demographic characteristics of respondents and non-respondents

Demographic variable	Respondents (*N* = 268)		Non-respondents (N = 68)	
	Mean (SD)	*n* (%)	Mean (SD)	*n* (%)
Gender				
Male		112 (41.8)		27 (38.6)
Female		156 (58.2)		39 (55.7)
Age	39.8 (12.3)*		45.6 (11.7)*†	
Practice experience (years)	15.0 (11.3)*		19.8 (11.8)*‡	
Experience with PA intervention				
(based on median scores)				
Short		121 (45.1)		26 (48.1)‡
Long		147 (54.9)		28 (51.9)‡
Sort of practice/workplace				
Solo practice		7 (2.6)		3 (4.3)†
Duo practice		9 (3.4)		1 (1.4)†
Group practice		183 (68.3)		36 (51.4)†
Multidisciplinary HC center		61 (22.8)		11 (15.7)†
Other		8 (3.0)		4 (5.7)†
SES intervention participants				
Mostly high SES		6 (2.2)		4 (5.7)†
50-50		141 (52.6)		30 (42.9)†
Mostly low SES		121 (45.1)		21 (30.0)†

Note. Results of chi-square tests and independent t-tests are reported; *, *p* ‹ .05; †, based on *N* = 55; ‡, based on *N* = 54; HC, health care; SES, socio economic status

Implementation fidelity

Physical therapists' completeness and quality scores are shown in Table 2. Mean completeness scores ranged from 5.6 (SD = 1.4; i.e., contact with referring professional) to 6.2 (SD = 0.7; i.e., intake), which indicates that on average respondents deliver PA interventions following the intervention protocol to more than half to almost all of the intervention participants. Mean quality scores were lower, but still fairly high with mean scores ranging from 4.9 (SD = 1.2; i.e., attention to maintenance of PA) to 5.5 (SD = 0.9; i.e., intake). This indicates that on average respondents are satisfied with how they deliver PA interventions. Correlations between completeness and quality scores ranged between .36 and .68 indicating that they were different outcome measures (data not shown).

7

Role of different PA interventions in data

Intraclass correlations are displayed in Table 2. Intraclass correlations for completeness were higher compared to intraclass correlations for quality, which indicates that the influence of the different PA interventions was larger for how respondents report completeness of delivery compared to how they report quality of delivery. Intraclass correlations for intake, training program, and evaluation completeness were higher than .10 supporting the appropriateness of multilevel analyses [225].

Table 2. Mean completeness and quality scores and intraclass correlations (N = 268)

Intervention component	Completeness		Quality	
	Mean (SD)	ICC	Mean (SD)	ICC
A. Intake	6.2 (0.7)	.11	5.5 (0.9)	.00
B. Training program	6.1 (0.7)	.12	5.4 (0.8)	.00
C. Evaluation	6.1 (1.1)	.15	5.1 (1.1)[†]	.00[†]
D. Attention to maintenance of PA	6.0 (1.2)	.03	4.9 (1.2)	.04
E. Contact with referring professional	5.6 (1.4)[†]	.10[†]	4.9 (1.2)[†]	.01[†]
Total	6.0 (0.7)	.04	5.2 (0.8)	.00

Note. SD, standard deviation; ICC, intraclass correlation; PA, physical activity; [†], N = 255

Domains

Table 3 shows descriptive variables and correlations for all domains. Mean scores indicated that physical therapists have generally favorable perceptions towards delivering PA interventions following the intervention protocol. Highest mean scores were found for the domains *Knowledge* (M = 5.95, SD = 0.84), *Organization* (M = 5.82, SD = 1.06), and *Skills* (M = 5.80, SD = 1.01). This indicates that respondents are positive about their knowledge and skills to deliver PA interventions following the intervention protocol and that the organization they work in provides them with sufficient resources and support to deliver PA interventions following the intervention protocol. Lowest mean scores were found for the domains *Negative emotions* (M = 1.68, SD = 0.79), *Socio-political context* (M = 3.05, SD = 1.22), and *Innovation strategy* (M = 4.16, SD = 0.96). This indicates that respondents experience few negative emotions while working with the PA intervention they are delivering, and that they think that the medical culture and availability of support from the socio-political context can be improved, in addition to innovation strategies, such as training, material, and reimbursement. Correlations between domains were mostly small or medium, while eleven correlations were large.

Table 3. Correlations and descriptive statistics for all domains (*N* = 268)

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18
D1 Knowledge		.72**	.68**	.34**	.09	.37**	.23**	.17**	.20**	.05	.14**	.14*	.06	.16**	.33**	-.30**	.28**	.24**
D2 Skills			.76**	.38**	.11	.43**	.36**	.19**	.16**	.03	.15*	.22**	.04	.24**	.32**	-.32**	.35**	.37**
D3 Social/prof. role and identity				.33**	.08	.45**	.41**	.21**	.15*	.09	.11	.22**	.11	.28**	.25**	-.26**	.31**	.33**
D4 Beliefs about capabilities					.30**	.50**	.39**	.27**	.54**	.14	.34**	.29**	.23**	.43**	.46**	-.36**	.63**	.55**
D5 Optimism						.23**	.08	.07	.21**	.09	.23**	.18**	.02	.16**	.30**	-.15*	.21**	.15**
D6 Beliefs about consequences							.50**	.35**	.32**	.14*	.30**	.40**	.28**	.46**	.50**	-.31**	.50**	.41**
D7 Intentions								.35**	.22**	.17**	.25**	.37**	.19**	.43**	.35**	-.31**	.46**	.46**
D8 Goals									.18**	.07	.18**	.25**	.07	.27**	.26**	-.26**	.30**	.30
D9 Innovation										.29**	.28**	.20**	.26**	.34**	.35**	-.29**	.42**	.43**
D10 Socio-political context											.17**	.19**	.16*	.31**	.28**	-.26**	.21**	.21**
D11 Organization												.19**	.36**	.24**	.16*	-.02	.18**	.14*
D12 Patient													.17**	.43**	.34**	-.22**	.34**	.36**
D13 Innovation strategy														.25**	.17**	-.02	.13*	.09
D14 Social influences															.37**	-.22**	.48**	.46**
D15 Positive emotions																-.52**	.48**	.38**
D16 Negative emotions																	-.40**	-.33**
D17 Behavioral regulation																		.51**
D18 Nature of the behaviors																		
Cronbach's alpha	.93	.85	.91	.84	.79	.83	.91	.88	.68	.72	.85	.74	.82	.86	.86	.85	.77	.86
(number of items)	(4)	(3)	(3)	(11)	(3)	(12)	(3)	(2)	(5)	(3)	(4)	(2)	(7)	(7)	(6)	(6)	(6)	(6)
Mean	5.95	5.80	5.75	5.37	5.46	5.12	5.68	4.95	4.82	3.05	5.82	5.51	4.16	5.11	5.38	1.68	5.38	5.08
SD	0.84	1.01	1.00	0.66	0.91	0.76	1.06	1.19	0.84	1.22	1.06	0.86	0.96	0.92	0.86	0.79	0.70	0.99

Note. SD, standard deviation; *, *p* < .05; **, *p* < .01

7

Domains and implementation fidelity

With regard to total completeness and quality, univariate multilevel analyses revealed multiple significant predictors (Table 4). Based on ranked p-values, most important predictors of both total completeness and quality were *Beliefs about capabilities, Behavioral regulation, Nature of the behaviors*, and *Knowledge*. Furthermore, *Beliefs about consequences* was one of the most important predictors of total completeness and *Positive emotions* was one of the most important predictors of total quality. Multivariate analyses resulted in only one significant predictor of both total completeness and quality, i.e., *Beliefs about capabilities*. Together, TDF domains accounted for 23% ($p < .001$) of the variance in both total completeness and quality of delivery.

Most important predictors of physical therapists' total completeness and quality scores were confirmed by univariate multilevel analyses on completeness and quality of delivery of the different intervention components (Tables 5 and 6). *Knowledge, Skills, Beliefs about capabilities*, and *Behavioral regulation* were significantly associated with completeness and quality of delivery of all intervention components. In addition to these domains, *Nature of the behaviors*, *Beliefs about consequences*, and *Positive emotions* were significantly associated with quality, but not completeness of delivery, of all intervention components.

Domains unrelated to implementation fidelity outcomes were *Innovation strategy* (i.e., unrelated to total completeness and quality of delivery) and *Optimism, Socio-political context*, and *Negative emotions* (i.e., unrelated to total completeness; Table 4). Furthermore, the domains *Innovation strategy* and *Socio-political context* were unrelated to completeness of any of the intervention components (Table 5).

Table 4. **Domains and total completeness and quality of delivery (*N* = 268)**

		Univariate analyses						Multivariate analysis					
		Completeness			Quality			Completeness			Quality		
		b	95% CI	*p*	*b*	95% CI	*p*	*b*	95% CI	*p*	*b*	95% CI	*p*
D1	Knowledge	**.20**	**0.11 - 0.30**	**.000**[5]	**.30**	**0.19 - 0.40**	**.000**[5]	.32	0.15 - 0.50	.000	.48	0.30 - 0.67	.000
D2	Skills	.17	0.09 - 0.25	.000[6]	.24	0.15 - 0.33	.000[6]						
D3	Social/professional role and identity	.13	0.04 - 0.21	.003[10]	.15	0.06 - 0.25	.001[13]						
D4	Beliefs about capabilities	**.43**	**0.32 - 0.55**	**.000**[1]	**.60**	**0.48 - 0.73**	**.000**[1]						
D5	Optimism				.16	0.06 - 0.26	.003[14]						
D6	Beliefs about consequences	**.26**	**0.15 - 0.37**	**.000**[3]	.30	0.28 - 0.42	.000[7]						
D7	Intentions	.14	0.06 - 0.22	.000[7]	.13	0.04 - 0.22	.005[15]						
D8	Goals	.09	0.02 - 0.16	.014[12]	.08	0.00 - 0.16	.041[17]						
D9	Innovation	.14	0.04 - 0.24	.006[11]	.24	0.13 - 0.35	.000[8]						
D10	Socio-political context				.08	0.01 - 0.16	.034[16]						
D11	Organization	.09	0.01 - 0.17	.033[14]	.18	0.10 - 0.27	.000[10]						
D12	Patient	.11	0.02 - 0.21	.022[13]	.19	0.08 - 0.30	.001[12]						
D13	Innovation strategy												
D14	Social influences	.16	0.07 - 0.25	.001[8]	.21	0.11 - 0.31	.000[11]						
D15	Positive emotions	.17	0.07 - 0.27	.001[9]	**.30**	**0.20 - 0.41**	**.000**[4]						
D16	Negative emotions				-.25	-0.37 – -0.13	.000[9]						
D17	Behavioral regulation	**.33**	**0.22 - 0.45**	**.000**[2]	**.40**	**0.27 - 0.53**	**.000**[2]						
D18	Nature of the behaviors	**.19**	**0.11 - 0.27**	**.000**[4]	**.27**	**0.18 - 0.36**	**.000**[3]						
	Model fit (R²)								.23			.23	

Note. *b*, regression coefficient; overall *p*-value is .05 after false discovery rate controlling procedure for multiple testing; CI, confidence interval (note that *p*-values were controlled for multiple testing and CIs were not)

Bold results indicate most important predictors based on corrected *p*-values

Superscript numbers indicate rank of *p*-value

7

Table 5. Domains and completeness of intervention components (univariate analyses; *N* = 268)

		A. Intake		B. Training program		C. Evaluation		D. Attention to maintenance of PA		E. Contact with referring professional[†]		#
		b	95% CI	b	95% CI	b	96% CI	b	96% CI	b	96% CI	
D1	**Knowledge**	.16	0.06 – 0.25	.16	0.06 – 0.25	.18	0.04 – 0.32	.28	0.11 – 0.44	.27	0.07 – 0.46	**5/5**
D2	**Skills**	.12	0.04 – 0.20	.14	0.06 – 0.22	.17	0.06 – 0.29	.18	0.04 – 0.32	.24	0.08 – 0.41	**5/5**
D4	**Beliefs about capabilities**	.31	0.19 – 0.43	.33	0.21 – 0.45	.35	0.17 – 0.53	.56	0.35 – 0.76	.65	0.41 – 0.90	**5/5**
D17	**Behavioral regulation**	.27	0.16 – 0.39	.33	0.22 – 0.45	.26	0.09 – 0.43	.34	0.15 – 0.54	.50	0.27 – 0.74	**5/5**
D18	Nature of the behaviors	.14	0.06 – 0.22	.21	0.13 – 0.29	.21	0.09 – 0.33			.25	0.09 – 0.42	4/5
D6	Beliefs about consequences	.24	0.13 – 0.34	.28	0.18 – 0.38					.42	0.21 – 0.64	3/5
D7	Intentions	.16	0.09 – 0.24	.18	0.10 – 0.25					.19	0.04 – 0.35	3/5
D14	Social influences	.18	0.09 – 0.27	.18	0.09 – 0.26					.29	0.11 – 0.47	3/5
D15	Positive emotions	.14	0.04 – 0.24	.18	0.09 – 0.28			.25	0.09 – 0.41			3/5
D3	Social/professional role and identity			.11	0.03 – 0.19					.21	0.04 – 0.37	2/5
D8	Goals			.11	0.04 – 0.18					.18	0.03 – 0.32	2/5
D9	Innovation			.14	0.04 – 0.24			.24	0.07 – 0.41			2/5
D16	Negative emotions	-.14	-0.24 – -0.03	-.11	-0.22 – -0.01							2/5
D5	Optimism							.28	0.13 – 0.43			1/5
D11	Organization	.09	0.01 – 0.17									1/5
D12	Patient			.13	0.04 – 0.23							1/5
D10	Socio-political context											0/5
D13	Innovation strategy											0/5

Note. [†], *n* = 255; *b*, regression coefficient; overall *p*-value is .05 after false discovery rate controlling procedure for multiple testing; CI, confidence interval (note that *p*-values were controlled for multiple testing and CIs were not)

Table 6. Domains and quality of delivery of intervention components (univariate analyses; *N* = 268)

	A. Intake		B. Training program		C. Evaluation		D. Attention to maintenance of PA		E. Contact with referring professional[†]		#
	b	95% CI	b	95% CI	b	96% CI	b	96% CI	b	96% CI	
D1 Knowledge	.22	0.09 – 0.34	.24	0.12 – 0.35	.33	0.18 – 0.48	.28	0.11 – 0.46	.42	0.25 – 0.59	**5/5**
D2 Skills	.21	0.11 – 0.31	.22	0.12 – 0.31	.28	0.15 – 0.41	.16	0.02 – 0.31	.33	0.19 – 0.48	**5/5**
D4 Beliefs about capabilities	.48	0.33 – 0.63	.56	0.43 – 0.70	.74	0.56 – 0.91	.69	0.48 – 0.90	.55	0.34 – 0.77	**5/5**
D6 Beliefs about consequences	.17	0.04 – 0.31	.32	0.19 – 0.44	.39	0.21 – 0.56	.23	0.04 – 0.42	.41	0.22 – 0.61	**5/5**
D15 Positive emotions	.23	0.11 – 0.35	.28	0.16 – 0.39	.44	0.29 – 0.59	.25	0.07 – 0.42	.30	0.13 – 0.47	**5/5**
D17 Behavioral regulation	.29	0.15 – 0.44	.40	0.26 – 0.53	.47	0.28 – 0.65	.38	0.18 – 0.59	.45	0.24 – 0.65	**5/5**
D18 Nature of the behaviors	.22	0.12 – 0.32	.32	0.22 – 0.41	.35	0.22 – 0.48	.20	0.05 – 0.34	.24	0.09 – 0.39	**5/5**
D11 Organization			.23	0.14 – 0.32	.22	0.09 – 0.34	.17	0.03 – 0.31	.17	0.03 – 0.31	4/5
D3 Social/professional role and identity			.14	0.04 – 0.24	.19	0.06 – 0.32			.23	0.08 – 0.38	3/5
D5 Optimism	.13	0.02 – 0.25	.18	0.07 – 0.28			.23	0.07 – 0.39			3/5
D7 Intentions			.19	0.10 – 0.28	.20	0.07 – 0.32			.17	0.04 – 0.31	3/5
D9 Innovation			.33	0.21 – 0.44	.23	0.08 – 0.40	.35	0.17 – 0.52			3/5
D12 Patient	.16	0.04 – 0.28	.25	0.14 – 0.37	.22	0.06 – 0.37					3/5
D14 Social influences			.21	0.10 – 0.31	.20	0.05 – 0.34	.24	0.08 – 0.40	.30	0.13 – 0.46	3/5
D16 Negative emotions	-.20	-0.33 – -0.07	-.34	-0.46 – -0.22	-.46	-0.62 – -0.30					3/5
D8 Goals					.13	0.02 – 0.24					1/5
D10 Socio-political context											1/5
D13 Innovation strategy			.11	0.02 – 0.19			.19	0.03 – 0.34			1/5

Note. [†], *n* = 255; *b*, regression coefficient; overall *p*-value is .05 after false discovery rate controlling procedure for multiple testing; CI, confidence interval (note that *p*-values were controlled for multiple testing and CIs were not)

7

Discussion

Related to the recently growing literature on physical therapists' evidence-based practices and implementation of specific guidelines, this study investigated physical therapists' completeness and quality of delivery of PA interventions. To our knowledge, this is the first study that investigated physical therapists' implementation of PA interventions in general, and the factors associated with their implementation behaviors.

Respondents reported that they deliver PA interventions with high fidelity. Their completeness and quality scores indicate that they deliver PA interventions following the intervention protocol to more than half to almost all of their patients and that they are satisfied with the quality that they provide. Completeness scores appear to be quite to very good, particularly when considering that tailoring PA interventions to individual patients' needs may at times require deviation from the protocol [57]. These high scores may be to some extent explained by the time and effort physical therapist associations and collaborations invest in the implementation of PA interventions, for example, by developing PA intervention protocols, providing training, and organizing meetings. The findings do, however, suggest that quality of delivery can still be improved. Although differences in study design and measurement of implementation fidelity make it difficult to compare study outcomes, our results seem in line with Swinkels et al. [56] who found that physical therapists' practices matched the evidence-based guideline for the majority of patients with low back pain and van der Wees et al. [57] who found that physical therapists' adherence to the Acute ankle injury guideline was quite high, but that there was still room for improvement.

Most important factors associated with implementation fidelity were physical therapists' 1. knowledge, 2. skills, 3. beliefs about capabilities to deliver PA interventions following the intervention protocol, 4. beliefs about consequences of delivering PA interventions following the intervention protocol, 5. positive emotions towards working with PA interventions, 6. plans with regard to intervention delivery, including what to do when barriers, such as lack of time or lack of patient motivation, are encountered, and 7. the extent to which delivering PA interventions following the intervention protocol is an automatic behavior. The importance of these domains was previously reported in qualitative studies on health care professional behavior [32,40,179,180,203]. Furthermore, constructs related to the domains *Knowledge* [55], *Beliefs about capabilities* (i.e., self-efficacy [37,172], perceived behavioral control [37,113,172]), *Beliefs about consequences* (i.e., outcome expectations [37,172], attitudes [113,172,217]), *Behavioral regulation* (i.e., action planning [37,172], coping planning [37]), and *Nature of the behaviors* (i.e., automaticity or habit [37,113,172]) were found to predict health care professional behaviors in multiple quantitative studies. The findings suggest suitable theories to further investigate physical therapists' implementation of PA interventions, e.g., Social Cognitive Theory [139], Theory of Planned Behavior [138], and self-regulation theory [226]. Furthermore, when linking associated domains to techniques of behavior change [30,35], strategies to enhance physical therapists' implementation fidelity may include: a. discussion and elaboration of guidelines to enhance knowledge and beliefs about consequences [15], b. modeling and self-monitoring to enhance beliefs about capabilities and skills [15], c. forming implementation intentions to enhance planning [15], and d. self-monitoring and positive feedback to increase automaticity of implementing PA interventions following the intervention protocol [227]. This could, for example, be achieved by well-designed implementation strategies, such as the provision of workshops, conferences, and systems to register behaviors related to guidelines.

Together, the domains accounted for 23% of the variance in both total completeness and quality of delivery. This percentage is somewhat higher compared to results of Beenstock et al. [47], who found that TDF domains together with professional and demographic variables accounted for 20% of variance in midwives' referral behavior. However, the percentage is slightly lower compared to studies using only social-cognitive factors as predictors of health care professionals' behaviors. In their systematic review, Godin et al. [228] found that 31% of the variation in these behaviors could be explained by social-cognitive factors. Although Huijg et al. [173] demonstrated discriminant validity of the domains of the DIBQ, the lower percentage of explained variance in our study might be explained by the large correlations between some of the domains, implying that they are not independent. In addition, the fact that only one significant predictor was found in the multivariate analyses, while in the univariate analyses many domains were significantly associated with the outcome variables, indicates that domains explain more or less the same part of variation in implementation behavior. This can be explained by the fact that the TDF does not specify relationships between domains, which exist between the theoretical constructs that are integrated in the TDF. Taking the approach of exploring direct relationships between domains and implementation behavior therefore lacks the theoretical strength of the individual theories that inform the TDF. The results suggest that the TDF is a good framework for use in implementation science in the sense that domains are included that relate to implementation behavior, but that more efforts are needed in formulating the paths via which the domains influence this behavior. Moreover, the TDF may be used taking a different approach, e.g., to operationalize different theories and compare their predictive validity, or to operationalize a specific theory (e.g., the Theory of Planned Behavior [138]) and investigate the integration of other theoretical domains (e.g., Environmental context and resources) to enhance the prediction of health care professionals' behaviors.

Domains that were unrelated to implementation completeness were physical therapists' optimism, their negative emotions, and characteristics of the socio-political context and innovation strategies. The lack of effect of optimism and negative emotions may be related to physical therapists' feedback on these specific questionnaire items that emotions do not play a role in how they do their work. However, positive emotions was significantly related to the outcome variables. Noticeably, domains unrelated to implementation fidelity mainly concerned the context, while most important factors associated with implementation fidelity were related to the individual physical therapist. A plausible explanation for the lack of effect of the context domains might be that we included physical therapists who were already delivering PA interventions to their patients, as we were interested in physical therapists' implementation behaviors. Therefore, usually encountered contextual barriers before delivery takes place (i.e., in the adoption stage), such as lack of financial support from insurance companies and a consequent lack of PA intervention respondents, did no longer play a role. The results correspond with previous research in which it was observed that contextual factors are mostly related to the adoption of innovations and not so much to their implementation [137,149].

Some limitations of this study should be taken into account when interpreting the results. First, we took the perspective that, generally, PHC-based interventions are effective when they are delivered as intended. However, more research is needed to identify the active ingredients within PA intervention components and the conditions under which interventions are effective [229].

7

Second, the study was cross-sectional, and as a consequence only associations and no causal relationships could be determined. In addition, we used a self-report questionnaire to assess implementation fidelity, which due to a possible social desirable response could have led to more favorable completeness and quality of delivery ratings. Specifically, it might be problematic to ask physical therapists to rate the quality of their own practices, which in this study is operationalized by a series of satisfaction questions. Moreover, it might be difficult for physical therapists to recall their behaviors with regard to specific tasks (i.e., recall bias). Future studies may wish to observe physical therapists delivering PA interventions to their patients, but in this preliminary stage of using a TDF-based questionnaire we found that it was important to collect data from a large sample of physical therapists delivering a variety of PA interventions. Furthermore, the high mean scores on implementation completeness could possibly have been prevented by applying the same strategy that we used for the assessment of quality of delivery, i.e., by combining the 'none' and 'a few' response categories and adding a category between 'half' and 'all'. Only 55.2% of the physical therapists completed the questionnaire, which suggests a potential selection bias of study recruitment. In addition, comparisons between respondents and non-respondents indicated that the latter were significantly older and had more practice experience. Although the response rate is similar to Shirley et al. [116] and van der Wees et al. [205], the respondents may have been those who find it more important to deliver PA interventions following the intervention protocol. This might be an explanation for the high scores on implementation fidelity and little variation among them and limits the generalizability of our results. The sample that was used for this study comprised physical therapists delivering PA interventions to people with COPD, diabetes, arthritis, or obesity. Although the sample of our study is a heterogeneous group, the PA interventions that they deliver might be more similar to each other than other PA interventions, such as PA interventions for people with low back pain. Therefore, our findings should be interpreted with caution and cannot be automatically generalized to physical therapists delivering PA interventions to other target groups. Finally, we did not ask respondents for the reasons why they may not have followed the intervention protocol. We would recommend to include such a question in future research, as deviation from the protocol might be a good thing, for example when it concerns tailoring the intervention to individual patients' needs. Furthermore, it can provide information on how to improve PA intervention protocols.

Conclusions

To our knowledge, this study was the first to investigate physical therapists' completeness and quality of delivery of PA interventions in general, as well as the theory-based factors potentially influencing their implementation behaviors. Exploring influencing factors using a TDF-based questionnaire can help identify theories that can be used to further investigate the implementation of PA interventions [182]. Knowledge on what factors influence physical therapists' implementation fidelity can inform the development of strategies to promote the effective implementation of PA interventions, which can ultimately enhance the public health impact of evidence-based PA interventions [6,7,35–38]. With regard to the first two research questions, respondents report that they deliver PA interventions following the intervention protocol to the majority of the intervention participants and that they are satisfied with the quality that they provide. Based on most important factors associated with completeness and quality of delivery, it can be hypothesized that implementation fidelity may be enhanced by developing implementation strategies that increase physical therapists' capabilities, beliefs about capabilities, beliefs about consequences, positive

emotions, quality of implementation plans, and the automaticity of delivery of PA interventions following the intervention protocol (i.e., research question 3). Future studies should preferably focus on investigating causal relationships between factors and implementation behaviors and incorporate more objective measures of implementation fidelity. Finally, when theory-based determinants are targeted by implementation strategies, this should be done by well-specified behavior change techniques [229] and their effectiveness should be investigated in randomized controlled trials.

7

Appendix 1. PA intervention components, tasks, and example items measuring implementation fidelity

PA Intervention components	Tasks	Example items
A. Intake		With how many participants did you…
	Discuss patient history	…discuss the patient history?
	Determine goals	…determine PA intervention goals?
	Administer questionnaires	…administer the PAR-Q?
	Do physical tests	…do the 6MWT?
	Report intake	…report the intake data following the reporting guidelines?
	Intake satisfaction	How satisfied are you with how you did the intake?
B. Training program		For how many participants did you…
	Set up training program	…set up a training program based on the intake?
	Training program content	…provide a training program with strength and cardio training?
	Intensity	…provide a training program for at least 3 months 2 times a week?
	Do measurements	…regularly measure training parameters?
	Report parameters	…report the parameters data following the reporting guidelines?
	Training program satisfaction	How satisfied are you with how you delivered the training program?
C. Evaluation		With how many participants did you…
	Conduct evaluation session	…conduct an evaluation session?
	Check goal achievement	…check if goals were achieved?
	Retake questionnaires	…retake the questionnaires from the intake at least once?
	Repeat physical tests	…repeat the physical tests from the intake at least once?
	Report evaluation	…report the evaluation data following the reporting guidelines?
	Evaluation satisfaction	How satisfied are you with how you did the evaluation?
D. Attention to maintenance of PA	Attention to maintenance of PA	For how many participants did you… …give attention to the maintenance of PA after the intervention is finished?
	Attention to maintenance of PA satisfaction	How satisfied are you with how you gave attention to participants' maintenance of PA after the intervention is finished?
E. Contact with referring professional	Contact with referring professional	For how many participants did you… …report to the referring professional on the course and results of the PA intervention?
	Contact with referring professional satisfaction	How satisfied are you with how you reported to the referring professional?

Note. PA, physical activity

The questionnaire was developed in Dutch. For the purpose of writing this manuscript, items were translated to English.

Domains	Constructs	Items
D1 Knowledge	Knowledge (1) Role clarity (3)	I know how to deliver [PA intervention] following the intervention protocol Objectives of [PA intervention] and my role in this are clearly defined for me With regard to [PA intervention] I know what my responsibilities are In my work with [PA intervention] I know exactly what is expected from me
D2 Skills	Skills (3)	I have been trained in delivering [PA intervention] following the intervention protocol I have the skills to deliver [PA intervention] following the intervention protocol I am practiced to deliver [PA intervention] following the intervention protocol
D3 Social/ professional role and identity	Professional role (3)	Delivering [PA intervention] following the intervention protocol is part of my work as a PT As a PT it is my job to deliver [PA intervention] following the intervention protocol It is my responsibility as a PT to deliver [PA intervention] following the intervention protocol
D4 Beliefs about capabilities	Self-efficacy (4)	I am confident that I can deliver [PA intervention] following the intervention protocol I am confident that I can deliver [PA intervention] following the intervention protocol even when other professionals with whom I deliver [PA intervention] do not do this I am confident that I can deliver [PA intervention] following the intervention protocol even when there is little time I am confident that I can deliver [PA intervention] following the intervention protocol even when participants are not motivated
	Perceived behavioral control (7)	I have control over delivering [PA intervention] following the intervention protocol For me, delivering [PA intervention] following the intervention protocol is (very difficult – very easy) For me, performing the intake is (very difficult – very easy) For me, delivering the training program is (very difficult – very easy) For me, performing the evaluation is (very difficult – very easy) For me, giving attention to participant's maintenance of PA behavior outside [PA intervention] is (very difficult – very easy) For me, reporting about the [PA intervention] to the referring professional is (very difficult – very easy)
D5 Optimism	Optimism (3)	In my work as a PT, in uncertain times, I usually expect the best In my work as a PT, I'm always optimistic about the future In my work as a PT, overall, I expect more good things to happen than bad

7

Domains	Constructs	Items
D6 Beliefs about consequences	Attitude (4)	For me, delivering [PA intervention] following the intervention protocol is (not useful at all – very useful)
		For me, delivering [PA intervention] following the intervention protocol is (not worthwhile at all – very worthwhile)
		For me, delivering [PA intervention] following the intervention protocol is (not pleasurable at all – very pleasurable)
		For me, delivering [PA intervention] following the intervention protocol is (not interesting at all – very interesting)
	Outcome expectancies (5)	If I deliver [PA intervention] following the intervention protocol [PA intervention] will be most effective
		If I deliver [PA intervention] following the intervention protocol participants will appreciate this
		If I deliver [PA intervention] following the intervention protocol this will strengthen the collaboration with professionals with whom I deliver [PA intervention]
		If I deliver [PA intervention] following the intervention protocol I will feel satisfied
		If I deliver [PA intervention] following the intervention protocol it will help participants to be more physically active
	Reinforcement (3)	When I deliver [PA intervention] following the intervention protocol, I get financial reimbursement
		When I deliver [PA intervention] following the intervention protocol, I get recognition from the work context
		When I deliver [PA intervention] following the intervention protocol, I get recognition from participants
D7 Intentions	Intention (3)	I intend to deliver [PA intervention] following the intervention protocol in the next three months
		I will definitely deliver [PA intervention] following the intervention protocol in the next three months
		How strong is your intention to deliver [PA intervention] following the intervention protocol in the next three months
D8 Goals	Priority (2)	How often is working on something else on your agenda a higher priority than delivering [PA intervention] following the intervention protocol
		How often is working on something else on your agenda more urgent than delivering [PA intervention] following the intervention protocol
D9 Innovation	Innovation characteristics (5)	It is possible to tailor [PA intervention] to participants' needs
		It is possible to tailor [PA intervention] to professionals' needs
		[PA intervention] costs little time to deliver
		[PA intervention] is compatible with daily practice
		[PA intervention] is simple to deliver

Domains	Constructs	Items
D10 Socio-political context	Socio-political context (3)	Government and local authorities provide sufficient support for interventions such as [PA intervention]
		Insurance companies provide sufficient support for interventions such as [PA intervention]
		Primary health care is sufficiently oriented towards prevention
D11 Organization	Organizational resources and support (4)	In the organization I work, all necessary resources are available to deliver [PA intervention]
		I can count on support from the management of the organization I work in, when things get tough around delivering [PA intervention] following the intervention protocol
		The management of the organization I work in is willing to listen to my problems with delivering [PA intervention] following the intervention protocol
		The management of the organization I work in is helpful with delivering [PA intervention] following the intervention protocol
D12 Patient	Patient characteristics (2)	Participants of [PA intervention] are motivated
		Participants of [PA intervention] are positive about [PA intervention]
D13 Innovation strategy	Innovation strategies (7)	[Implementing organization] provides professionals with a training to deliver [PA intervention]
		[Implementing organization] provides the possibility to experience delivering [PA intervention] before professionals need to commit to it
		[Implementing organization] provides sufficient intervention materials
		[Implementing organization] provides assistance to professionals with delivering [PA intervention]
		[Implementing organization] organizes intervision meetings for professionals
		[Implementing organization] provides sufficient financial reimbursement to professionals for [PA intervention] delivery
		[Implementing organization] provides insights into results of [PA intervention]
D14 Social influences	Subjective norm (2)	Most people who are important to me think that I should deliver [PA intervention] following the intervention protocol
		Professionals with whom I deliver [PA intervention] think I should deliver [PA] intervention] following the intervention protocol
	Descriptive norm (2)	Professionals with whom I deliver [PA intervention] deliver [PA] intervention following the intervention protocol
		Other professionals who work with [PA intervention] deliver [PA intervention] following the intervention protocol
	Social support (3)	I can count on support from professionals with whom I deliver [PA intervention] when things get tough around delivering [PA intervention] following the intervention protocol
		Professionals with whom I deliver [PA intervention] are willing to listen to my problems with delivering [PA intervention] following the intervention protocol
		Professionals with whom I deliver [PA intervention] are helpful with delivering [PA intervention] following the intervention protocol

Domains	Constructs	Items
D15 Positive emotions	Positive emotions (6)	When I work with [PA intervention] I feel optimistic
		When I work with [PA intervention] I feel comfortable
		When I work with [PA intervention] I feel calm
		When I work with [PA intervention] I feel relaxed
		When I work with [PA intervention] I feel cheerful
		When I work with [PA intervention] I feel elated
D16 Negative emotions	Negative emotions (6)	When I work with [PA intervention] I feel nervous
		When I work with [PA intervention] I feel pessimistic
		When I work with [PA intervention] I feel depressed
		When I work with [PA intervention] I feel agitated
		When I work with [PA intervention] I feel sad
		When I work with [PA intervention] I feel uncomfortable
D17 Behavioral regulation	Action planning (3)	I have a clear plan of how I will deliver [PA intervention] following the intervention protocol
		I have a clear plan under what circumstances I will deliver [PA intervention] following the intervention protocol
		I have a clear plan when I will deliver [PA intervention] following the intervention protocol
	Coping planning (3)	I have a clear plan with regard to delivering [PA intervention] following the intervention protocol when participants are not motivated
		I have a clear plan with regard to delivering [PA intervention] following the intervention protocol when there is little time
		I have a clear plan with regard to delivering [PA intervention] following the intervention protocol when other professionals with whom I deliver [PA intervention] do not do this
D18 Nature of the behaviors	Automaticity (4)	Delivering [PA intervention] following the intervention protocol is something I do automatically
		Delivering [PA intervention] following the intervention protocol is something I do without having to consciously remember
		Delivering [PA intervention] following the intervention protocol is something I do without thinking
		Delivering [PA intervention] following the intervention protocol is something I start doing before I realize I am doing it
	Memory (2)	Delivering [PA intervention] following the intervention protocol is something I seldom forget
		Delivering [PA intervention] following the intervention protocol is something I often forget

Note. PA, physical activity; PT, physical therapist

7