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Self-Efficacy as a Longitudinal Predictor of Perceived Cognitive Impairment in Individuals with Multiple Sclerosis

Abbey J. Hughes, PhD^{1,2}, Meghan Beier, PhD¹, Narineh Hartoonian, PhD², Aaron P. Turner, PhD^{1,2}, Dagmar Amtmann, PhD¹, and Dawn M. Ehde, PhD¹

¹Department of Rehabilitation Medicine, University of Washington, Seattle, Washington

²Multiple Sclerosis Center of Excellence West, Veterans Affairs Puget Sound Health Care System, Seattle, Washington

Abstract

Objective—Self-efficacy plays an important role in symptom management and may be predictive of perceived cognitive impairment (PCI) for individuals with multiple sclerosis (MS). The primary aim of this study was to determine if self-efficacy longitudinally predicts two types of PCI in MS: general cognitive functioning and executive functioning. The secondary aim was to assess whether self-efficacy mediates the relationships between depression, fatigue, and PCI.

Design—Longitudinal analysis of self-report survey data collected over three years. Hierarchical regression analyses examined the relationship between self-efficacy and PCI, adjusting for depression and fatigue. Additional analyses tested self-efficacy as a mediator between depression, fatigue, and PCI.

Setting—Community-dwelling individuals with MS.

Participants—233 individuals (age range 22–83 years) were recruited from a larger longitudinal survey study of 562 individuals with MS.

Interventions—Not applicable.

Main Outcome Measures—Primary outcome measures were the Applied Cognition General Concerns (ACGC) and Executive Function (ACEF) domains of the Quality of Life in Neurological Disorders (NeuroQoL) measures.

Results—Self-efficacy was significantly correlated with PCI at baseline ($r = .40$ to $.53$) and three years later ($r = .36$ to $.44$). In multivariate regression analyses, self-efficacy was a significant

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Correspondence and reprint requests should be addressed to: Abbey J. Hughes, PhD, NMSS Postdoctoral Research Fellow, Department of Rehabilitation Medicine, University of Washington, 325 Ninth Avenue, Box 359612, Seattle, Washington 98104, ajhughes@uw.edu, Telephone: (206) 221-5688.

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longitudinal predictor of PCI, both for general cognitive functioning ($\beta = .20, p < .01$) and executive functioning ($\beta = .16, p < .05$). Self-efficacy partially mediated the relationships between depression, fatigue, and PCI.

Conclusions—Self-efficacy may influence how individuals with MS will perceive their cognitive functioning over time. Interventions that target self-efficacy, particularly early in the disease course, may lead to improvements in PCI, as well as improvements in fatigue and depression.

Keywords

multiple sclerosis; longitudinal survey; self-efficacy; cognition; executive function; self-report

Perceived Cognitive Impairment (PCI) is an individual's perception of his or her ability to learn, remember, concentrate, or make decisions that affect everyday life, and is one of the most common concerns reported among individuals living with multiple sclerosis (MS). PCI is often associated with emotional distress,¹ and has been shown to significantly interfere with daily functional activities and may reduce health-related quality of life.² As a result, research has increasingly focused on factors that predict and enhance self-management of PCI in MS.³⁻⁵ A comprehensive understanding of these mechanisms is essential to developing effective interventions that will promote self-management and enhance quality of life in MS.

Grounded in Bandura's social cognitive theory, self-efficacy has been identified as an important, if not necessary, component of self-management and healthy psychosocial functioning.⁶ Bandura defined self-efficacy as an individual's belief about his or her capacity to succeed or produce a certain desired outcome in a given situation.⁶ At a fundamental level, self-efficacy creates a perceived baseline by which individuals plan and evaluate future behaviors. Self-efficacy has been implicated in the adjustment to and management of numerous acute and chronic medical conditions, including epilepsy, spinal cord and traumatic brain injury, fibromyalgia, diabetes, and arthritis.⁷⁻¹² Research has demonstrated that positive self-efficacy is a modifiable treatment target related to better functional outcomes, lower levels of depression, and higher quality of life.¹³⁻¹⁵ Furthermore, intervention studies that have specifically targeted self-efficacy have demonstrated that enhancing self-efficacy can lead to improvements in chronic disease outcomes.¹⁶⁻¹⁸

Among individuals with MS, self-efficacy has been shown to be a significant determinant of physical activity behaviors,^{19,20} employment productivity (i.e., hours worked)²¹, healthy nutritional choices,²² adherence to injectable disease-modifying therapies,²³ fatigue²⁴, depression²⁵, and anxiety.²⁶ In a recent validation study of the University of Washington Self-Efficacy Scale (UWSES), higher self-efficacy was associated with better mental and physical health, less fatigue, less stress, less pain, better sleep, and fewer depressive symptoms.²⁷ Additionally, interventions aimed at increasing self-efficacy have resulted in improved physical and psychosocial outcomes. A randomized controlled trial of an eight-week wellness program for women with MS resulted in better health-related quality of life, reductions in pain, and more positive health behaviors.²⁸ Similarly, an intensive four-day educational wellness program resulted in significant improvements in self-efficacy and

health-related quality of life that were independent of physical disability and lasted up to six months post-intervention.²⁹

Although self-efficacy plays an important role in managing health-related symptoms, at present, little is known about the relationship between self-efficacy and PCI in MS. Only one study to date has explicitly reported on findings regarding self-efficacy and PCI in MS. The cross-sectional study demonstrated that self-efficacy may play an important role in self-reported cognitive outcomes, and that this relationship is significant even after accounting for variables related to PCI (e.g., disease duration, physical disability, and depression).³⁰ However, longitudinal data are needed to examine the prospective relationship between self-efficacy and PCI.

The primary aim of this study was to determine if self-efficacy longitudinally predicts two types of PCI in individuals with MS: concerns with general cognitive functioning (e.g., attention, concentration) and concerns with executive functioning (e.g., planning, problem-solving). We hypothesized that self-efficacy would predict both domains of PCI three years later, even after accounting for the effects of depression and fatigue.³¹ Because previous research has identified self-efficacy as a potential mediator in the relationship between depression and health-related outcomes,^{32,33} our second aim was to assess whether self-efficacy mediates the relationships between depression, fatigue, and PCI. We hypothesized that the effect of depression and fatigue on PCI will be partially mediated by self-efficacy. Results of this investigation will help characterize the role of self-efficacy in PCI and evaluate the salience of self-efficacy as a target for self-management interventions.

Methods

Participants and Procedures

The study was conducted as part of a larger longitudinal survey study assessing multiple symptoms and quality of life in community-dwelling individuals with MS and was approved by the University of Washington Institutional Review Board. Recruitment was conducted by the MS Rehabilitation Research and Training Center, a collaborative group of rehabilitation researchers, physicians, psychologists, and public health professionals.^{27,34,35} Participants were recruited with letters of invitation ($n = 7,805$) through the Greater Northwest chapter of the National MS Society. Eligible participants were required to be 18 years of age, able to read and write in English, and report having a definitive MS diagnosis by a physician. After providing informed consent and confirming eligibility, each eligible participant was then mailed a survey packet, and given the option to complete and return the surveys via mail or online.

Of the 1,628 who responded and were evaluated for eligibility, 1,596 were confirmed to be eligible for study inclusion. The primary reason for exclusion ($n = 32$) was absence of an MS diagnosis. 1,271 individuals completed the first survey, and of those, a subset of 562 individuals were randomly selected and invited to participate in a longitudinal series of eight additional surveys, collected from November 2006 to October 2012. Each survey required approximately three hours to complete, with the measures included in the present study requiring approximately 20 minutes to complete.

The present study's primary variables of interest (i.e., self-efficacy and PCI) were assessed on the seventh and ninth surveys. In this study, "Time 1" (T1) refers to the seventh survey (administered in 2009, approximately 2.5 years following the larger study's baseline), and "Time 2" (T2) refers to the ninth survey (administered in 2012, approximately three years after T1 and 5.5 years after baseline). For the purposes of this study, the sample was defined as individuals who provided complete data for both T1 and T2. Of the 562 individuals included in the larger study, 244 participants returned both T1 and T2 surveys. Because 10 participants returned incomplete data, the present study yielded a final sample of 234 individuals. As indicated in previous studies of this longitudinal dataset, individuals who failed to return surveys did not differ at baseline on medical characteristics.

Measures

The survey included self-report measures of self-efficacy, PCI, demographic and disease-related variables (i.e., age, sex, race, education level, MS subtype, disease duration, disability status), fatigue, and depression (Table 1).

Self-efficacy—Self-efficacy was assessed using the short-form of the UWSES, a six-item Likert-type scale that asks participants how confident they feel about managing various aspects of their MS.²⁷ This measure has been validated on a sample of MS patients and demonstrates good internal consistency (*Cronbach's* $\alpha = .90$) and convergent validity ($r = .81$).²⁷ Raw scores were converted to standardized *T* scores, which have a mean of 50 and standard deviation of 10. Higher scores are associated with greater self-efficacy.

Perceived cognitive impairment—PCI was assessed using the Applied Cognition – General Concerns (ACGC) and Applied Cognition – Executive Function (ACEF) subtests of the Quality of Life in Neurological Disorders (NeuroQoL) measurement system.³⁶ The ACGC consists of eight Likert-type scale items that assess how frequently various perceived general cognitive concerns have occurred over the past seven days, and the ACEF consists of eight Likert-type scale items that assesses how much perceived difficulty the participant currently has with various higher-order cognitive processes. The NeuroQoL was normed on a clinical neurology population that included individuals with MS and has evidenced good internal consistency (*Cronbach's* $\alpha = .85 - .97$) and test-retest reliability (*ICC* = $.73 - .94$).³⁷ Raw scores for each subtest were converted to standardized *T* scores ($M = 50$, $SD = 10$). Higher scores are associated with fewer concerns or less difficulty.

MS subtype—A self-report measure of MS clinical course asked participants to select their own disease course as it corresponded to five graphic images and corresponding descriptions of the major MS disease subtypes.³⁵ Disease subtypes were relapsing-remitting (RRMS), secondary progressive (SPMS), primary progressive (PPMS) or progressive relapsing (PRMS) MS. This measure was validated on a sample of MS patients and their physicians and demonstrates sufficient inter-rater reliability (*Cohen's* $\kappa = .45$).³⁵

Disability status—A self-report version of the Expanded Disability Status Scale (EDSS) was used to assess MS-related disease severity.^{38,39} Previous research has demonstrated that self-reported EDSS has excellent agreement with physician-reported EDSS (*ICC* = $.87$).³⁹

For this study, participants were categorized into three levels of disability based on their self-reported EDSS scores: minimal (EDSS = 0 – 4.0), intermediate (EDSS = 4.5 – 6.5), and advanced (EDSS = 7 – 9.5). This ordinal scale was used for all analyses.

Fatigue—Fatigue was assessed using the Short Form version 1.0 – Fatigue 4a (SFF) of the Patient Reported Outcomes Measurement Information System (PROMIS).⁴⁰ It consists of seven Likert-type scale items that assess how frequently the participant has experienced various fatigue symptoms over the past seven days. Previous research has demonstrated feasibility and validity of PROMIS measures in patients with MS.⁴⁰ Raw scores were transformed to standardized *T* scores ($M = 50$, $SD = 10$). Higher scores were associated with greater levels of fatigue.

Depressive symptoms—Depressive symptoms were measured using the Patient Health Questionnaire-9 (PHQ-9).⁴¹ For each item, the participant rates how frequently he/she has been bothered by the nine depressive symptoms over the last two weeks. This measure demonstrates adequate test-retest reliability ($ICC = .94$) and internal consistency ($Cronbach's\ \alpha = .86$).⁴¹ Raw scores were summed, with higher total summary score reflecting greater depressive symptom severity.

Data Analysis

Statistical analyses were carried out using SPSS version 22 (SPSS, Inc., 2013) for individuals whose data were collected at both T1 and T2. The data were inspected with respect to statistical assumptions including evaluation of descriptive statistics, normality, and linearity. Internal consistency ratings (*Cronbach's alpha*) were calculated for self-efficacy, PCI, depression, and fatigue measures. For correlation and regression analyses, the data did not violate assumptions of multicollinearity and normality. All Variance Inflation Factor values were less than 1.7, and all Tolerance values were greater than 0.5.

Preliminary Pearson product-moment correlations (for continuous data) or Spearman rank-order correlations (for ordinal data) were performed to replicate previous findings that self-efficacy, depression, and fatigue are associated with PCI, and to identify any other potential covariates (i.e., age, education level, EDSS, disease duration). Any variable that significantly correlated with T1 or T2 ACGC or ACEF ($p < .05$) was entered as a covariate in subsequent regression analyses. Next, two separate and identical hierarchical linear regression analyses examined T1 UWSES as a longitudinal predictor of T2 ACGC and T2 ACEF, adjusting for significant covariates. For each analysis, significant T1 covariates were entered into the first step, and T1 UWSES was entered into the second step, with either T2 ACGC or T2 ACEF entered as the outcome variable. Lastly, UWSES was examined as a potential mediator using the regression and bootstrapping methods recommended by Preacher and Hayes.^{42,43} Specifically, three linear regressions were examined to confirm associations between PHQ-9/SFF (i.e., the predictor) and ACGC/ACEF (i.e., the outcome), between UWSES (i.e., the proposed mediator) and ACGC/ACEF, and between PHQ-9/SFF and UWSES. Bootstrapping procedures then calculated a regression coefficient and 95% confidence interval (CI) for the indirect effect of PHQ-9/SFF on ACGC/ACEF. A CI that did not include zero indicated likely mediation.

Results

Participants

Descriptive statistics for demographic and disease-related variables, fatigue, depression, self-efficacy, and PCI are presented in Table 1. Participants were predominately White, non-Hispanic, and female. Participants tended to be highly educated, with the majority completing at least some college. Disease duration ranged from 3 to 50 years with the majority reporting EDSS within the intermediate disability range and a diagnosis of RRMS. On average, the sample endorsed mild levels of depression⁴¹ and scored at least one standard deviation below the population mean on PCI measures.³⁷ Self-efficacy scores were comparable to those obtained in the normative MS sample.²⁷ *Cronbach's alpha* internal consistency ratings were high for all self-report measures: UWSES ($\alpha = .90$), PHQ-9 ($\alpha = .85$), SFF ($\alpha = .87$), ACGC ($\alpha = .94$), and ACEF ($\alpha = .89$).

Correlation Analyses

As indicated in Table 2, T1 UWSES was strongly correlated with T1 and T2 ACGC and ACEF, where higher UWSES scores accompanied higher ACGC and ACEF scores (all $ps < .001$). Depression (PHQ-9) and fatigue (SFF) were also strongly correlated with T1 and T2 ACGC and ACEF (all $ps < .001$), where higher SFF and PHQ-9 scores accompanied lower ACGC and ACEF scores. Age, education level, disease duration, and EDSS were not related to ACGC or ACEF measures (all $ps > .05$). Thus, only PHQ-9 and SFF scores were included as covariates in hierarchical regression analyses.

Longitudinal Regression Analyses

Hierarchical regression analyses supported the hypothesis that T1 UWSES longitudinally predicts T2 ACGC and ACEF (Table 3). For ACGC, the first step (T1 PHQ-9 and SFF scores) was significant and accounted for 27.2% of the variance in ACGC ($R^2 = .272$, $F(2, 231) = 43.05$, $p < .001$). The addition of UWSES in the second (final) step accounted for an additional 2.5% of the variance in ACGC ($R^2 = .025$, $F(1, 230) = 8.02$, $p = .005$), and resulted in a final model that was statistically significant and explained 29.6% of the variance in ACGC ($R^2 = .296$, $F(3, 230) = 32.24$, $p < .001$).

For ACEF, the first step (T1 PHQ-9 and SFF scores) was significant and accounted for 19.2% of the variance in ACEF ($R^2 = .192$, $F(2, 231) = 27.38$, $p < .001$). The addition of UWSES in the second (final) step accounted for an additional 1.5% of the variance in ACEF ($R^2 = .015$, $F(1, 230) = 4.23$, $p = .041$), and resulted in a final model that was statistically significant and explained 20.6% of the variance in ACEF ($R^2 = .206$, $F(3, 230) = 19.92$, $p < .001$).

Attenuation of PHQ-9 and SFF beta-weights in both hierarchical regression analyses suggested a mediating role for UWSES. Using the procedures outlined previously,⁴² results supported UWSES as a partial mediator for the relationships between SFF and ACGC ($\beta = -.05$, $CI = -.10$ to $-.01$), PHQ-9 and ACGC ($\beta = -.11$, $CI = -.19$ to $-.03$), SFF and ACEF ($\beta = -.04$, $CI = -.10$ to $-.01$) and PHQ-9 and ACEF ($\beta = -.09$, $CI = -.19$ to $-.02$).

Discussion

The present study found that self-efficacy for managing MS symptoms significantly predicts PCI, both cross-sectionally and longitudinally over three years, even after accounting for the impact of depression and fatigue on PCI. Additionally, self-efficacy partially mediates the relationships between fatigue, depression and PCI. Consistent with previous research, demographic and physical disability were not predictive of PCI.^{44,45} Taken together, results suggest that individuals' perceptions of their abilities to manage their symptoms predict the presence and severity of perceived cognitive impairment, which has important implications for predicting positive health outcomes (e.g., community integration) and for designing successful self-management interventions.

Results of this study are particularly relevant for clinical practice, where self-management interventions that encourage participation in healthy activities, improve perceptions of control, and provide symptom relief may reduce the degree to which perceived cognitive impairments interfere with everyday functioning in MS.⁴⁶ Similar results have been observed for individuals with traumatic brain injury, where self-management interventions employ cognitive impairment remediation strategies to improve self-efficacy, reduce depression and fatigue that are known to exacerbate perceived cognitive impairment, and enhance everyday functional skills.⁸ Interventions that improve self-efficacy not only improve health outcomes, but also reduce health care costs.⁴⁷

This study afforded several major strengths over previous research. It featured a longitudinal design with a large sample of community-dwelling individuals with MS. A review of the current literature revealed only two longitudinal studies of self-efficacy in MS, one as a predictor of health-related quality of life,⁴⁵ and the other on physical activity behaviors.⁴⁸ However, neither study explicitly investigated PCI. The present study was necessary to evaluate the prospective relationship between self-efficacy and PCI. The present study replicated and extended the cross-sectional findings of Schmitt et al.³⁰ by demonstrating that current levels of self-efficacy are important predictors of long-term perceived cognitive functioning outcomes. Although causal inferences cannot be drawn from observational data, and a bi-directional relationship between self-efficacy and PCI cannot be ruled out, the prospective nature of this study supported a likely sequence of events and controlled for baseline effects. These results may translate to clinical practice, where early interventions to improve self-efficacy may reduce long-term effects on perceived cognitive impairment.

The study's sample and measures were also methodological strengths. The sample was heterogeneous with regard to age, sex, and disease-related characteristics, as well as scores on the primary predictor and outcome variables. In contrast to previous studies that frequently involved in-person screening evaluations, mailed surveys allowed individuals with geographical and physical limitations to participate. This encouraged inclusion of individuals with more severe symptoms, who are often excluded from such studies.

With regard to measurement, the short-form of the UWSES is a valid and efficient measure with sound psychometric properties for use with MS samples.²⁷ The NeuroQoL ACGC and ACEF have also been applied in MS and provided the opportunity to examine two domains

of perceived cognitive functioning. Results support the concept that self-efficacy is a general construct that impacts individuals' perception of their abilities across multiple cognitive domains.

The inclusion of the PHQ-9 and SFF as covariate measures offered an additional methodological advantage. Although numerous studies have shown that depression accounts for a significant portion the variance in PCI,⁴⁹ the present study demonstrated that self-efficacy provides a unique contribution to PCI beyond the contributions of depression and fatigue. No prior studies controlled for both of these variables. Moreover, the PHQ-9 and SFF were sufficiently distinct to warrant inclusion in the regression models without causing multicollinearity, thus allowing us to examine the unique contributions of depression and fatigue to PCI.

The current results also added to this literature by including mediational analyses. Self-efficacy was found to significantly mediate the relationships between fatigue, depression, and PCI, and this finding held for both ACGC and ACEF. These results were similar to those of Stuifbergen and colleagues, who demonstrated a mediating role for self-efficacy in health-related quality of life outcomes in individuals with MS.⁵⁰ However, mediation effect sizes in the present study were generally small, and depression and fatigue maintained direct effects on PCI. In chronic, degenerative neurological disorders such as MS, it is important to consider that the factors influencing functional outcomes are exceedingly complex and can exert their influence via multiple paths. Results from this study highlight the importance of assessing depression and fatigue along with self-efficacy.

Limitations

While results support self-efficacy as a key factor in predicting PCI, this study did not assess whether this relationship holds true for objective cognitive functioning. Indeed, several studies have found the associations between perceived and objective cognitive measures to be weak, and that individuals who are currently in a depressive episode are particularly inaccurate in their self-assessment of their cognition.^{1,31} Future research is needed to determine longitudinal associations of self-efficacy with objective neuropsychological outcomes. Second, although the present survey methodology afforded efficient, standardized data collection and a more inclusive, heterogeneous sample relative to interview methods, this method introduced the potential for sample bias by precluding the opportunity to assess causes of attrition or ensure participant comprehension of survey items. Future studies may address this limitation by including follow-up interviews (e.g., telephone) to reduce attrition and clarify item content. Finally, although three years of data provided novel insights on the longitudinal role of self-efficacy in PCI, MS is a long-term chronic and degenerative disease, and individuals are likely to experience multiple shifts in their adjustment, self-efficacy, and self-management behaviors over the disease course. Consequently, continued prospective longitudinal cohort assessment is needed to examine the nuances of self-efficacy as a dynamic construct.

Conclusions

This study was the first to examine how self-efficacy longitudinally predicts PCI. Baseline self-efficacy predicted two domains of PCI three years later. Importantly, these effects were independent of the effects of depression and fatigue, and self-efficacy in fact partially mediated the relationships between depression, fatigue, and PCI. Interventions that target self-efficacy for managing the cognitive changes, apparent or perceived, that so often occur in MS may lead to improvements in PCI. They may also reduce the negative impact of fatigue and depression on PCI. Self-management interventions, which typically aim at improving self-efficacy as well as self-management skills, may be ideal for improving individuals' confidence that they can navigate the challenges associated with cognitive impairment, improving health-related quality of life in MS, and reducing health care costs.

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List of Abbreviations

MS	multiple sclerosis
UWSES	University of Washington Self-Efficacy Scale
PCI	perceived cognitive impairment
NeuroQoL	Quality of Life in Neurological Disorders
ACGC	Applied Cognition General Concerns
ACEF	Applied Cognition Executive Function
RRMS	relapsing remitting multiple sclerosis
PPMS	primary progressive multiple sclerosis
SPMS	secondary progressive multiple sclerosis
PRMS	progressive relapsing multiple sclerosis
EDSS	Expanded Disability Status Scale
PROMIS	Patient Reported Outcome Measurement Information System
SFF	PROMIS Short-Form Fatigue Scale
PHQ-9	Patient Health Questionnaire – 9

Table 1
Descriptive statistics for T1 demographic and disease-related variables, fatigue, depression, and self-efficacy, and T1 and T2 PCI measures

	<i>n</i>	%	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Demographic Variables						
Age			22	83	53.83	10.54
Sex (F)	199	85				
Education Level						
High School/GED or less	33	14.1				
Some College	88	37.6				
College Degree	69	29.5				
Some Graduate or higher	44	18.8				
Ethnic Background						
NH White	215	91.9				
NH Black	4	1.7				
NH American						
Indian/Alaskan	1	0.4				
Native						
NH Bi- or multi-racial	6	2.6				
Hispanic White	6	2.6				
Hispanic Bi- or multi-racial	2	0.9				
Disease-related Variables						
MS Subtype						
RRMS	136	58.1				
SPMS	58	24.8				
PPMS	28	12				
PRMS	12	5.1				
Disease Duration (yrs)			3	50	15.88	9.66
EDSS						
Minimal (0 – 4.0)	77	32.9				
EDSS (4.5 – 6.5)	111	47.4				
EDSS (7 – 9.5)	46	19.37				

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	<i>n</i>	%	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Fatigue (SFF)			29.40	77.10	57.36	8.12
Depression (PHQ-9)			0	23	6.23	4.90
Self-efficacy (UWSES)			28.90	68.90	49.74	8.76
PCI			18.39	60.82	40.27	7.82
ACGC (T1)			18.39	60.82	40.27	7.82
ACEF (T1)			16.66	58.98	42.63	9.04
ACGC (T2)			23.00	59.30	39.72	7.09
ACEF (T2)			20.80	57.60	40.67	7.77

Note. *n* = 234. ACEF = Applied Cognition Executive Function; ACGC = Applied Cognition General Concerns; EDSS = Expanded Disability Status Scale; GED = General Education Diploma; NH = Non-Hispanic; PCI = Perceived Cognitive Impairment; PHQ-9 = Patient Health Questionnaire – 9; PPMS = primary progressive MS; PRMS = progressive relapsing MS; RRMS = relapsing-remitting MS; SFF = Short Form Fatigue Scale; SPMS = secondary progressive MS; T1 = Time 1; T2 = Time 2; UWSES = UW Self-Efficacy Scale.

Table 2
Correlations between T1 predictors and T1 and T2 PCI measures

T1 Predictors	T1 PCI		T2 PCI	
	ACGC	ACEF	ACGC	ACEF
Age	0.06	-0.02	0.10	0.04
Education Level ^a	-0.03	-0.04	0.07	0.01
Disease Duration	0.03	0.02	0.00	-0.07
EDSS ^a	-0.07	-0.09	-0.04	-0.11
SFF	-0.55 [‡]	-0.41 [‡]	-0.47 [‡]	-0.36 [‡]
PHQ-9	-0.57 [‡]	-0.52 [‡]	-0.45 [‡]	-0.41 [‡]
UWSES	0.53 [‡]	0.39 [‡]	0.44 [‡]	0.36 [‡]

Note. $n = 234$.

^a Spearman's rank-order correlations (all other data are Pearson's product-moment correlations).

* $p < .05$;

[†] $p < .01$;

[‡] $p < .001$.

Table 3
Hierarchical Regression of T1 Self-Efficacy, Fatigue, and Depression on T2 PCI Measures

Variable	df	R ²	R ²	F	β
ACGC					
Step 1	2, 231	.27	.27	43.05 [‡]	
SFF					-.32 [‡]
PHQ-9					-.27 [‡]
Step 2	1, 230	.30	.03	8.02 [†]	
SFF					-.26 [‡]
PHQ-9					-.19 [†]
UWSES					.20 [†]
ACEF					
Step 1	2, 231	.19	.19	27.38 [‡]	
SFF					-.20 [†]
PHQ-9					-.29 [‡]
Step 2	1, 230	.21	.02	4.23 [*]	
SFF					-.15 [*]
PHQ-9					-.24 [†]
UWSES					.15 [*]

Note. *n* = 234.
* *p* < .05;
† *p* < .01;
‡ *p* < .001.