

Appendix E. Differential Item Functioning of PROMIS-PLUS Heart Failure Items by Domain and Condition, Cross-sectional Sample

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Overview of Patient-Reported Outcome Measurement Information System (PROMIS)-PLUS Heart Failure domain tables in this Appendix:

1. Ability to Engage in SRA
2. Anxiety
3. Depression
4. Dyspnea
5. Fatigue
6. Illness Burden
7. Physical Function
8. Satisfaction with SRA
9. Sleep Disturbance

Note: Only domains with four or more items were analyzed.

Appendix E, Table 1: Differential Item Functioning of Ability to Participate in Social Roles and Activities Domain, HF cross-sectional sample

Items	<u>Chi² Values</u>		<u>McFadden Pseudo R²</u>		DIF Interpret.
	Uniform Model 1 v 2	Non-uniform Model 2 v 3	<u>Change Value</u>		
			Uniform Model 1 v 2	Non-uniform Model 2 v 3	
Sex (male vs. female)					
I have trouble doing my regular daily work around the house	0.029	0.169	0.003	0.001	No
I have trouble meeting the needs of my family	0.753	0.005	0.000	0.005	No
I am limited in doing my work (include work at home)	0.510	0.835	0.000	0.000	No
I have trouble doing everything for my family that I feel I should do	0.074	0.150	0.002	0.001	No
I have trouble accomplishing my usual work (include work at home)	0.441	0.619	0.000	0.000	No
I have trouble doing everything for work that I want to do (include work at home)	0.742	0.549	0.000	0.000	No
Age (≤55 vs. >55)					
I have trouble doing my regular daily work around the house	0.287	0.869	0.001	0.000	No
I have trouble meeting the needs of my family	0.053	0.956	0.002	0.000	No
I am limited in doing my work (include work at home)	0.687	0.904	0.000	0.000	No
I have trouble doing everything for my family that I feel I should do	0.767	0.652	0.000	0.000	No
I have trouble accomplishing my usual work (include work at home)	0.005	0.483	0.005	0.000	No
I have trouble doing everything for work that I want to do (include work at home)	0.670	0.731	0.000	0.000	No
Education (completed college or not)					
I have trouble doing my regular daily work around the house	0.096	0.021	0.002	0.003	No
I have trouble meeting the needs of my family	0.157	0.007	0.001	0.004	No
I am limited in doing my work (include work at home)	0.177	0.775	0.001	0.000	No
I have trouble doing everything for my family that I feel I should do	0.374	0.636	0.001	0.000	No
I have trouble accomplishing my usual work (include work at home)	0.315	0.748	0.001	0.000	No
I have trouble doing everything for work that I want to do (include work at home)	0.448	0.530	0.000	0.000	No

Abbreviation: DIF is Differential Item Functioning, Interpret. is Interpretation. Models: Model 1 = ability explanatory term only; Model 2 = ability + group explanatory terms; Model 3 = ability + group + ability-by-group interaction explanatory terms.

Appendix E, Table 2: Differential Item Functioning of Anxiety Domain, HF cross-sectional sample

Items	Chi ² Values		McFadden Pseudo R ²		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Sex (male vs. female)					
In the past 7 days...					
I worried about losing my independence.	0.763	0.754	0.000	0.000	No
I worried about fainting.	0.883	0.011	0.000	0.004	No
I worried that I would get swelling in my feet or legs.	0.295	0.131	0.001	0.001	No
I worried that my health would get worse	0.130	0.474	0.001	0.000	No
I worried about dying.	0.543	0.886	0.000	0.000	No
Age (≤55 vs. >55)					
In the past 7 days...					
I worried about losing my independence.	0.615	0.489	0.000	0.000	No
I worried about fainting.	0.247	0.420	0.001	0.000	No
I worried that I would get swelling in my feet or legs.	0.232	0.274	0.001	0.001	No
I worried that my health would get worse	0.985	0.839	0.000	0.000	No
I worried about dying.	0.927	0.625	0.000	0.000	No
Education (completed college or not)					
In the past 7 days...					
I worried about losing my independence.	0.836	0.650	0.000	0.000	No
I worried about fainting.	0.083	0.019	0.002	0.003	No
I worried that I would get swelling in my feet or legs.	0.524	0.831	0.000	0.000	No
I worried that my health would get worse	0.003	0.695	0.005	0.000	No
I worried about dying.	0.335	0.328	0.001	0.001	No

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Appendix E, Table 3: Differential Item Functioning of Depression Domain, HF cross-sectional sample

Items	Chi ² Values		McFadden Pseudo R ² Change Value		DIF Interpret.
	Uniform Model 1 v 2	Non-uniform Model 2 v 3	Uniform Model 1 v 2	Non-uniform Model 2 v 3	
Sex (male vs. female)					
In the past 7 days...					
I felt helpless	0.052	0.584	0.002	0.000	No
I felt sad	0.987	0.896	0.000	0.000	No
I felt that I wanted to give up on everything	0.590	0.070	0.000	0.002	No
I felt depressed	0.683	0.269	0.000	0.001	No
I felt unhappy	0.031	0.932	0.003	0.000	No
I felt hopeless	0.163	0.306	0.001	0.001	No
Age (≤55 vs. >55)					
In the past 7 days...					
I felt helpless	0.379	0.659	0.001	0.000	No
I felt sad	0.314	0.628	0.001	0.000	No
I felt that I wanted to give up on everything	0.159	0.072	0.001	0.002	No
I felt depressed	0.031	0.807	0.003	0.000	No
I felt unhappy	0.002	0.435	0.006	0.000	No
I felt hopeless	0.958	0.819	0.000	0.000	No
Education (completed college or not)					
In the past 7 days...					
I felt helpless	0.113	0.017	0.002	0.003	No
I felt sad	0.035	0.107	0.003	0.002	No
I felt that I wanted to give up on everything	0.002	0.018	0.005	0.003	No
I felt depressed	0.822	0.352	0.000	0.001	No
I felt unhappy	0.129	0.035	0.001	0.003	No
I felt hopeless	0.476	0.217	0.000	0.001	No

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Appendix E, Table 4: Differential Item Functioning of Dyspnea Domain, HF cross-sectional sample

Items	Chi ² Values		McFadden Pseudo R ² Change		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Sex (male vs. female)					
Over the past 7 days, how short of breath did you get with each of these activities?					
Walking 50 steps/paces on flat ground at a normal speed without stopping	0.920	0.350	0.000	0.001	No
Lifting something weighing 10-20 lbs (about 4.5-9 kg, like a large bag of groceries)	0.085	0.693	0.002	0.000	No
Walking (faster than your usual speed) for ½ mile (almost 1 km) without stopping	0.028	0.173	0.004	0.001	No
Walking 10 steps/paces on flat ground at a normal speed without stopping	0.996	0.001	0.000	0.007	No
Walking up 5 stairs without stopping	0.987	0.186	0.000	0.001	No
Walking up 10 stairs (1 flight) without stopping	0.003	0.967	0.006	0.000	No
Lifting something weighing less than 5 lbs (about 2 kg, like a houseplant)	0.012	0.017	0.004	0.004	No
Lifting something weighing 5-10 lbs (about 2-4.5 kg, like a basket of clothes)	0.024	0.841	0.003	0.000	No
Lifting something weighing more than 20 lbs (about 9 kg, like a medium-sized suitcase)	0.000	0.431	0.011	0.000	No
Carrying something weighing less than 5 lbs (about 2 kg, like a houseplant) from one room to another	0.009	0.668	0.004	0.000	No

Items	Chi ² Values		McFadden Pseudo R ² Change		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Age (≤55 vs. >55)					
Over the past 7 days, how short of breath did you get with each of these activities?					
Walking 50 steps/paces on flat ground at a normal speed without stopping	0.648	0.577	0.000	0.000	No
Lifting something weighing 10-20 lbs (about 4.5-9 kg, like a large bag of groceries)	0.405	0.699	0.001	0.000	No
Walking (faster than your usual speed) for ½ mile (almost 1 km) without stopping	0.601	0.018	0.000	0.004	No
Walking 10 steps/paces on flat ground at a normal speed without stopping	0.036	0.786	0.003	0.000	No
Walking up 5 stairs without stopping	0.539	0.851	0.000	0.000	No
Walking up 10 stairs (1 flight) without stopping	0.408	0.431	0.001	0.000	No
Lifting something weighing less than 5 lbs (about 2 kg, like a houseplant)	0.166	0.294	0.001	0.001	No
Lifting something weighing 5-10 lbs (about 2-4.5 kg, like a basket of clothes)	0.814	0.814	0.000	0.000	No
Lifting something weighing more than 20 lbs (about 9 kg, like a medium-sized suitcase)	0.067	0.445	0.002	0.000	No
Carrying something weighing less than 5 lbs (about 2 kg, like a houseplant) from one room to another	0.279	0.724	0.001	0.000	No

Items	Chi ² Values		McFadden Pseudo R ² Change		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Education (completed college or not)					
Over the past 7 days, how short of breath did you get with each of these activities?					
Walking 50 steps/paces on flat ground at a normal speed without stopping	0.089	0.305	0.002	0.001	No
Lifting something weighing 10-20 lbs (about 4.5-9 kg, like a large bag of groceries)	0.010	0.099	0.005	0.002	No
Walking (faster than your usual speed) for ½ mile (almost 1 km) without stopping	0.024	0.095	0.004	0.002	No
Walking 10 steps/paces on flat ground at a normal speed without stopping	0.104	0.685	0.002	0.000	No
Walking up 5 stairs without stopping	0.696	0.488	0.000	0.000	No
Walking up 10 stairs (1 flight) without stopping	0.285	0.209	0.001	0.001	No
Lifting something weighing less than 5 lbs (about 2 kg, like a houseplant)	0.309	0.412	0.001	0.000	No
Lifting something weighing 5-10 lbs (about 2-4.5 kg, like a basket of clothes)	0.598	0.305	0.000	0.001	No
Lifting something weighing more than 20 lbs (about 9 kg, like a medium-sized suitcase)	0.104	0.204	0.002	0.001	No
Carrying something weighing less than 5 lbs (about 2 kg, like a houseplant) from one room to another	0.001	0.926	0.007	0.000	No

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Appendix E, Table 5: Differential Item Functioning of Fatigue Domain, HF cross-sectional sample

Items	Chi ² Values		McFadden Pseudo R ²		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Sex (male vs. female)					
In the past 7 days, to what degree did you have to push yourself to get things done because of your fatigue?	0.009	0.313	0.004	0.001	No
In the past 7 days, how often did your fatigue make you feel slowed down in your thinking?	0.322	0.495	0.001	0.000	No
In the past 7 days, how often did you have to limit your social activities because of your fatigue?	0.724	0.902	0.000	0.000	No
In the past 7 days, how often were you too tired to do your household chores?	0.516	0.914	0.000	0.000	No
In the past 7 days, how often did you run out of energy?	0.922	0.940	0.000	0.000	No
In the past 7 days, how often did you feel tired?	0.001	0.571	0.007	0.000	No
During the past 7 days: I feel weak all over	0.803	0.104	0.000	0.002	No
During the past 7 days: I feel tired	0.438	0.278	0.000	0.001	No
During the past 7 days: I have energy	0.000	0.385	0.011	0.001	No
During the past 7 days: I am able to do my usual activities	0.025	0.284	0.003	0.001	No
In the past 7 days, how often did you need to take breaks to finish daily tasks?	0.454	0.585	0.000	0.000	No

Items	Chi ² Values		McFadden Pseudo R ²		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Age (≤55 vs. >55)					
In the past 7 days, to what degree did you have to push yourself to get things done because of your fatigue?	0.087	0.197	0.002	0.001	No
In the past 7 days, how often did your fatigue make you feel slowed down in your thinking?	0.677	0.768	0.000	0.000	No
In the past 7 days, how often did you have to limit your social activities because of your fatigue?	0.658	0.107	0.000	0.002	No
In the past 7 days, how often were you too tired to do your household chores?	0.307	0.252	0.001	0.001	No
In the past 7 days, how often did you run out of energy?	0.540	0.786	0.000	0.000	No
In the past 7 days, how often did you feel tired?	0.607	0.311	0.000	0.001	No
During the past 7 days: I feel weak all over	0.975	0.068	0.000	0.002	No
During the past 7 days: I feel tired	0.314	0.338	0.001	0.001	No
During the past 7 days: I have energy	0.311	0.002	0.001	0.006	No
During the past 7 days: I am able to do my usual activities	0.180	0.000	0.001	0.008	No
In the past 7 days, how often did you need to take breaks to finish daily tasks?	0.897	0.645	0.000	0.000	No

Items	<u>Chi² Values</u>		<u>McFadden Pseudo R²</u>		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Education (completed college or not)					
In the past 7 days, to what degree did you have to push yourself to get things done because of your fatigue?	0.049	0.172	0.002	0.001	No
In the past 7 days, how often did your fatigue make you feel slowed down in your thinking?	0.007	0.511	0.004	0.000	No
In the past 7 days, how often did you have to limit your social activities because of your fatigue?	0.253	0.139	0.001	0.001	No
In the past 7 days, how often were you too tired to do your household chores?	0.291	0.812	0.001	0.000	No
In the past 7 days, how often did you run out of energy?	0.007	0.212	0.005	0.001	No
In the past 7 days, how often did you feel tired?	0.005	0.098	0.005	0.002	No
During the past 7 days: I feel weak all over	0.488	0.845	0.000	0.000	No
During the past 7 days: I feel tired	0.457	0.574	0.000	0.000	No
During the past 7 days: I have energy	0.020	0.000	0.003	0.010	No
During the past 7 days: I am able to do my usual activities	0.843	0.002	0.000	0.006	No
In the past 7 days, how often did you need to take breaks to finish daily tasks?	0.819	0.667	0.000	0.000	No

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Appendix E, Table 6: Differential Item Functioning of Illness Burden Domain, HF cross-sectional sample

Items	Chi ² Values		McFadden Pseudo R ² Change		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Sex (male vs. female)					
In the past 7 days...					
Did you feel pressure to lose weight?	0.784	0.212	0.000	0.001	No
Did you feel burdened by having to monitor your health?	0.457	0.674	0.000	0.000	No
Did you feel burdened by having to monitor your weight?	0.055	0.713	0.002	0.000	No
Did you feel burdened by restrictions on what you could eat or drink?	0.236	0.829	0.001	0.000	No
Age (≤55 vs. >55)					
In the past 7 days...					
Did you feel pressure to lose weight?	0.441	0.178	0.000	0.001	No
Did you feel burdened by having to monitor your health?	0.101	0.733	0.002	0.000	No
Did you feel burdened by having to monitor your weight?	0.174	0.503	0.001	0.000	No
Did you feel burdened by restrictions on what you could eat or drink?	0.488	0.288	0.000	0.001	No
Education (completed college or not)					
In the past 7 days...					
Did you feel pressure to lose weight?	0.599	0.039	0.000	0.002	No
Did you feel burdened by having to monitor your health?	0.926	0.246	0.000	0.001	No
Did you feel burdened by having to monitor your weight?	0.057	0.856	0.002	0.000	No
Did you feel burdened by restrictions on what you could eat or drink?	0.042	0.538	0.002	0.000	No

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Appendix E, Table 7: Differential Item Functioning of Physical Function Domain, HF cross-sectional sample

Items	Chi ² Values		McFadden Pseudo R ² Change Value		DIF Interpret.
	Uniform Model 1 v 2	Non-uniform Model 2 v 3	Uniform Model 1 v 2	Non-uniform Model 2 v 3	
Sex (male vs. female)					
Does your health now limit you in bending, kneeling, or stooping?	0.022	0.949	0.003	0.000	No
Does your health now limit you in doing heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	0.658	0.431	0.000	0.000	No
Are you able to push open a heavy door?	0.308	0.078	0.001	0.002	No
Are you able to go for a walk of at least 15 minutes?	0.191	0.357	0.001	0.001	No
Does your health now limit you in going OUTSIDE the home, for example to shop or visit a doctor's office?	0.523	0.586	0.000	0.000	No
Are you able to walk a block (about 100 m) on flat ground?	0.465	0.045	0.000	0.002	No
Are you able to run 100 yards (100 m)?	0.715	0.175	0.000	0.001	No
Are you able to walk up and down two steps?	0.469	0.594	0.000	0.000	No
Does your health now limit you in climbing one flight of stairs?	0.019	0.229	0.003	0.001	No
Does your health now limit you in walking about the house?	0.945	0.025	0.000	0.003	No
Age (≤55 vs. >55)					
Does your health now limit you in bending, kneeling, or stooping?	0.060	0.141	0.002	0.001	No
Does your health now limit you in doing heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	0.305	0.448	0.001	0.000	No
Are you able to push open a heavy door?	0.939	0.433	0.000	0.000	No
Are you able to go for a walk of at least 15 minutes?	0.723	0.841	0.000	0.000	No

Items	Chi ² Values		McFadden Pseudo R ² Change Value		DIF Interpret.
	Uniform Model 1 v 2	Non-uniform Model 2 v 3	Uniform Model 1 v 2	Non-uniform Model 2 v 3	
Age (≤55 vs. >55) - continued					
Does your health now limit you in going OUTSIDE the home, for example to shop or visit a doctor's office?	0.347	0.134	0.001	0.001	No
Are you able to walk a block (about 100 m) on flat ground?	0.261	0.027	0.001	0.003	No
Are you able to run 100 yards (100 m)?	0.081	0.000	0.002	0.007	No
Are you able to walk up and down two steps?	0.720	0.151	0.000	0.001	No
Does your health now limit you in climbing one flight of stairs?	0.817	0.594	0.000	0.000	No
Does your health now limit you in walking about the house?	0.000	0.337	0.008	0.001	No
Education (completed college or not)					
Does your health now limit you in bending, kneeling, or stooping?	0.599	0.115	0.000	0.002	No
Does your health now limit you in doing heavy work around the house like scrubbing floors, or lifting or moving heavy furniture?	0.000	0.019	0.020	0.003	No
Are you able to push open a heavy door?	0.476	0.017	0.000	0.004	No
Are you able to go for a walk of at least 15 minutes?	0.001	0.257	0.006	0.001	No
Does your health now limit you in going OUTSIDE the home, for example to shop or visit a doctor's office?	0.002	0.525	0.006	0.000	No
Are you able to walk a block (about 100 m) on flat ground?	0.389	0.872	0.000	0.000	No
Are you able to run 100 yards (100 m)?	0.000	0.377	0.021	0.000	No
Are you able to walk up and down two steps?	0.000	0.636	0.012	0.000	No
Does your health now limit you in climbing one flight of stairs?	0.152	0.500	0.001	0.000	No
Does your health now limit you in walking about the house?	0.002	0.060	0.006	0.002	No

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Appendix E, Table 8: Differential Item Functioning of Satisfaction with Social Roles and Activities Domain, HF cross-sectional sample

Items	<u>Chi² Values</u>		<u>McFadden Pseudo R²</u>		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Sex (male vs. female)					
I am satisfied with my ability to maintain friendships	0.165	0.261	0.001	0.001	No
I am satisfied with how much work I can do (include work at home)	0.094	0.287	0.002	0.001	No
I am satisfied with my ability to work (include work at home)	0.620	0.247	0.000	0.001	No
I am satisfied with my ability to do household chores/tasks	0.210	0.652	0.001	0.000	No
I am satisfied with my ability to do things for fun at home (like reading, listening to music, etc.)	0.319	0.940	0.001	0.000	No
I am satisfied with the amount of time I spend performing my daily routines	0.021	0.174	0.003	0.001	No
Age (≤55 vs. >55)					
I am satisfied with my ability to maintain friendships	0.530	0.080	0.000	0.002	No
I am satisfied with how much work I can do (include work at home)	0.023	0.948	0.003	0.000	No
I am satisfied with my ability to work (include work at home)	0.452	0.725	0.000	0.000	No
I am satisfied with my ability to do household chores/tasks	0.693	0.152	0.000	0.001	No
I am satisfied with my ability to do things for fun at home (like reading, listening to music, etc.)	0.522	0.995	0.000	0.000	No
I am satisfied with the amount of time I spend performing my daily routines	0.006	0.139	0.004	0.001	No

Items	Chi ² Values		McFadden Pseudo R ²		DIF Interpret.
	Uniform	Non-uniform	Uniform	Non-uniform	
	Model 1 v 2	Model 2 v 3	Model 1 v 2	Model 2 v 3	
Education (completed college or not)					
I am satisfied with my ability to maintain friendships	0.008	0.096	0.004	0.002	No
I am satisfied with how much work I can do (include work at home)	0.941	0.877	0.000	0.000	No
I am satisfied with my ability to work (include work at home)	0.001	0.711	0.006	0.000	No
I am satisfied with my ability to do household chores/tasks	0.124	0.790	0.001	0.000	No
I am satisfied with my ability to do things for fun at home (like reading, listening to music, etc.)	0.148	0.998	0.001	0.000	No
I am satisfied with the amount of time I spend performing my daily routines	0.666	0.195	0.000	0.001	No

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Appendix E, Table 9: Differential Item Functioning of Sleep Disturbance Domain, HF cross-sectional sample

Items	Chi ² Values		McFadden Pseudo R ² Change Value		DIF Interpret.
	Uniform Model 1 v 2	Non-uniform Model 2 v 3	Uniform Model 1 v 2	Non-uniform Model 2 v 3	
Sex (male vs. female)					
In the past 7 days...					
My sleep quality was...	0.183	0.039	0.001	0.003	No
I got enough sleep.	0.045	0.198	0.002	0.001	No
I had a problem with my sleep.	0.656	0.574	0.000	0.000	No
I had difficulty falling asleep.	0.863	0.170	0.000	0.001	No
I tried hard to get to sleep.	0.070	0.784	0.002	0.000	No
I had trouble sleeping.	0.636	0.513	0.000	0.000	No
Age (≤55 vs. >55)					
In the past 7 days...					
My sleep quality was...	0.182	0.001	0.001	0.007	No
I got enough sleep.	0.228	0.079	0.001	0.002	No
I had a problem with my sleep.	0.358	0.069	0.001	0.002	No
I had difficulty falling asleep.	0.294	0.749	0.001	0.000	No
I tried hard to get to sleep.	0.476	0.669	0.000	0.000	No
I had trouble sleeping.	0.558	0.155	0.000	0.001	No
Education (completed college or not)					
In the past 7 days...					
My sleep quality was...	0.001	0.997	0.007	0.000	No
I got enough sleep.	0.296	0.057	0.001	0.002	No
I had a problem with my sleep.	0.742	0.068	0.000	0.002	No
I had difficulty falling asleep.	0.000	0.664	0.007	0.000	No
I tried hard to get to sleep.	0.491	0.527	0.000	0.000	No
I had trouble sleeping.	0.373	0.483	0.001	0.000	No

Abbreviation: DIF is Differential Item Functioning, Interpret. is Interpretation. Models: Model 1 = ability explanatory term only; Model 2 = ability + group explanatory terms; Model 3 = ability + group + ability-by-group interaction explanatory terms.