Supplementary Material for **GRACE**: **G**eneralizing **R**obot-**A**ssisted **C**aregiving with User Functionality **E**mbeddings

I. Simulated Robot Experiments Details

1) **Handover**: A user sitting in a wheelchair asks the robot to hand over an object in the environment. The robot selects a 3D handover position.
   - *Generalization Scenario*: The initial object location is randomized.
   - *Success*: The selected handover position is within the user's task-space fROM (computed by running forward kinematics on Θ_u).
   - *Agency*: Task-space distance between the user's resting position and handover.
2) **Rehab**: A robot guides a user in a wheelchair through an arm stretching exercise where the robot selects target joint positions and the user attempts to reach them.
   - *Generalization Scenario*: The initial joint positions of the user are sampled from their fROM.
   - *Success*: The target joint positions selected by the robot are within the user's fROM.
   - *Agency*: Joint-space distance between the initial and target positions.
3) **Dressing**: A robot selects a position at which to hold the arm-hole of a garment. The user attempts to reach that position and then extends their arm through the sleeve.
   - *Generalization Scenario*: The angle at which the robot should approach the user is randomized.
   - *Success*: The user can reach the selected position *and* subsequently extend their elbow by $45°$.
   - *Agency*: Task-space distance between the user's resting position and the arm-hole.
4) **Bathing**: A robot is performing assisted bed bathing. The user's arm must be repositioned. The robot decides whether to ask the user to independently move their arm, or to move their arm for them.
   - *Generalization Scenario*: The target joint positions for repositioning are randomized.
   - *Success*: Either the robot directly moves the user's arm, or the robot asks the user to independently move and their fROM allows them to do so.
   - *Agency*: Binary: 1 if the user moves their arm independently and 0 otherwise.

II. Additional References

We include additional references for the rebuttal response here [1] [2] [3] [4] [5] [6] [7].

TABLE I: Additional robot experiments across 5 users, 3 methods, and 3 conditions, separated by condition. GT refers to Ground Truth, UA refers to User Agnostic. We report the normalized mean value from user feedback.
GRACE performs similarly to GT, demonstrating adaptive assistance by maintaining appropriate user effort, sense of agency, and a high success rate. In contrast, the User-Agnostic model required significant effort in severe mobility conditions, leading to frequent failures, and showed reduced effort and sense of agency in conditions with mild limitations.

Method	Condition	Success	Effort	Agency	Comfort	Safety
GT	2 (severe)	**0.93**	0.60	0.68	**0.64**	0.72
GRACE	2 (severe)	**0.93**	0.64	0.64	**0.64**	0.84
UA	2 (severe)	0.53	**0.88**	**0.84**	0.40	**0.96**
GT	3 (severe)	**0.93**	0.72	0.64	0.64	**0.92**
GRACE	3 (severe)	**0.93**	0.68	0.76	**0.68**	0.88
UA	3 (severe)	0.47	**0.84**	**0.84**	0.48	0.76
GT	4 (mild)	**1.0**	0.44	**0.64**	0.84	0.80
GRACE	4 (mild)	**1.0**	**0.56**	0.60	**0.88**	**0.96**
UA	4 (mild)	**1.0**	0.52	0.56	0.84	0.80

TABLE II: Demographics and Anthropometrics of Participants. The units of measure are centimeters (CM).

Subject	Age	Gender	Race	Exercise	Height	Upper Body Length	Torso Length	Chest Circ.	Waist Circ.	Shoulder Width	Arm Length (R)	Forearm Length (R)	Arm Length (L)	Forearm Length (L)
1	24	F	South Asian	3x/wk, biking	160	81.4	45.5	104.5	93.5	33	34.3	26.5	34	26.5
2	21	M	Asian	2x/wk, gym	185	96.5	63	-	116	42.5	38.5	32.2	36	32
3	20	M	Asian	gym, sports	176	89.5	50.5	87	82	36	36	28	34.5	28.5
4	30	M	White	gym	174.8	90	50.5	97.7	85.5	34.5	39	28	38	28
5	22	F	Asian	2x/month, gym	163	84	43	81	64	33.5	33.5	25	32.5	25
6	20	M	Asian	5x/wk, gym	182	93.4	54	108	100.5	37	38	31	36.9	29.3
7	20	M	Asian	4x/wk, gym	170	83	49	96.5	96.5	37.5	35.5	27.5	34.5	27
8	22	M	South Asian	2x/wk, gym	177.5	89.5	49	89	74	36	38	29.5	37.5	29.5
9	28	M	South Asian	2x/wk, gym	180	86.5	45.5	96	94.5	31.5	32.3	33.5	32.5	32.5
10	24	M	South Asian	5x/wk, gym	173	84.5	52.5	97	86.5	37	38.5	29.5	38.5	29.5
11	20	F	Asian	3x/wk, gym	163	87	52	82	66.5	32	33.3	27.3	33	26.5

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