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Golf Buddy

As baby boomers get older there becomes an ever-increasing need for assistance in day-to-day life for this generation. A study from BMC Ophthalmology shows as age increases physical activity decreases (Sengupta, S., Nguyen, A.M, 2015). Things like muscles and sight degradation seem to decrease physical activity in participants between the ages of 60-80. We also know that exercise does not only help physically, but also mentally (Windle, G., Hughes, D., Linck, P., Russell, I., & Woods, B. (2010), Rethorst, C. D., Wipfli, B. M., & Landers, D. M. (2009). The studies will focus on these ages, as these old ages are the key demographic for a product like this. Overall, the device is a proof of concept and to gauge interest with older populations and their relationships with niche pieces of helpful mobility assistance focused robots. Not broad, do it all robots. This proposed robot is not just to help decrease the barrier to entry for older people, but also to improve a golfer's game. Research published from Exercise and Sport Sciences Reviews shows that robots can significantly help athletes with skilled actions, such as a golf swing (Reinkensmeyer, D. J., & Patton, J. L., 2009). Though this device is pointed towards older golfers, it could also help any golfer wanting repetition. Through research found on journals and research found by observing and surveying golfers, I found that a golf driving robot helper would benefit a lot of older golfers. This would be used at golf driving ranges where golfers practice their driving, chipping, or putting.

Design Research

At it was hard to find any related devices so the decision of what the device would look like and do was up to research I would conduct. I found that lower back pain was a main source of injury for older people (Garg, A., & Moore, J. S. , 1992). The study also showed that reputation and bending over were one of the main causes. The next form of research I did was an observational study at the driving range. I wanted to see if repeatedly bending over was an actual problem while practicing golf. Through the observation I found that bending over and getting balls out of the ball bucket was a repeated action. After that I interviewed some 10 random golfers I found there. Ages ranged from 46-73, all men. These questions can be found in the Appendix. Some did not find any major pains when bending over or playing golf. But over 70% agreed or strongly agreed to the survey question number 1. "I have trouble getting motivation to go out and golf because of body pains." The main take away from the interview were often sidelined by injuries or soreness. They also expressed interest in anything that could eliminate bending over.

Prototype



Hidden inside is the Arduino with a battery pack.



Located on the front was a servo motor to operate the door.



On the side there was an IR sensor that would detect movement

```
#include <Servo.h>

Servo myServo; // create servo object to control a servo
// twelve servo objects can be created on most boards

int pos = 0;
int sensorPin = A0; // variable to store the servo position
int sensorVal = 0;
void setup() {
  myServo.attach(9,1,180); // attaches the servo on pin 9 to the servo object
  myServo.write(180);
  Serial.begin(9600);
}

void loop() {
  myServo.write(180);
  if (analogRead(sensorPin) < 11){
    delay(2000);
    myServo.write(120);
    delay(150);
  }
  Serial.println(analogRead(sensorPin));
}
```

This was the code that open and shut the door when the IR sensor detected movement

Problems while designing

There were some problems with developing the code. Often the USB power would not be enough to power the IR sensor and the servo, but once I put it on the battery pack it would work fine. There was also a lack of design steps when I drew my first prototype. There was no way for the balls to get from the ball holder to the ball dispenser part of the device. I just put a cut up automotive funnel and place the balls in there. They lead the balls to a rail that would lead it to the door.

Evaluation Results

To evaluate the prototype, we use 3 participants. I recruited friends and family that I was already exposed to. Due to the covid-19 pandemic there was a limited pool of participants. I introduced them to the device and let them use as intended. After about 10 to 20 minutes, I gave them a survey (Appendix).

1-5	Increased Enjoyment	Preferred?	More active	Not helpful	Longer practice
P1	4	4	5	1	5
P2	4	3	4	1	4
P3	3	2	4	1	5

I found that overall, there was a positive response to the device. But the biggest success was in the consensus among all participants that they would be a more active golfer if they had their perfect version of this device. From this I can conclude that devices and technology that ease dangerous actions will help some older people get out of the house more to exercise. We also found that they adapted to the device well. No problems were present when the device was in it's intended context. The participants did however have some important quotes that could change the development of future prototypes:

"I think I'd use something like this if it could put the ball on the Tee."

-Participant 2

"I think it would be cool if it could pick up balls too"

- Participant 3

"There are some alternatives I think"

- Participant 1

We found the need for a way for the device to pick up balls and place balls on a Tee. Placing a ball on a Tee would drastically increase the use scenarios.

Timeline and Issues

Along with the problems I face while developing and programing there are some critiques of the design that I would like to implement.

The rest of the time would be dedicated to adding a feature to place a ball safely on a Tee.

There is also an idea to make sure it could pick up balls. The rest of the week would be dedicated to sketching a device that would incorporate these to critiques.

Appendix

Observation Study questions:

“What motions in particular are uncomfortable while golfing?”

“Does bending over cause you any pain?”

“What do you like about golfing?”

“What do you think about exercising?”

“How do you normally practice golfing (not including playing a round)?

“Does injury every keep you from golfing?”

Study before the prototype (scale 1-5)

5 = Strongly agree, 3 = indifferent, 1 = strongly disagree:

1. I have trouble getting motivation to go out and golf because of body pains.
2. I would like assistance practicing.
3. I don't golf as much as I used too
4. I wish I was outside more
5. I think practice is important, and I should be doing it more.

Study questions after the prototype (scale 1-5):

1. This device increase enjoyment
2. I prefer this over normal practice

3. I would be more active if I had a perfect device that worked like this
4. I don't think this helps me much
5. I would practice longer if I had this device

References

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