PROJECT **ZENKAI**

Motivational Fitness Products for Aging Americans

BUSINESS OPPORTUNITY

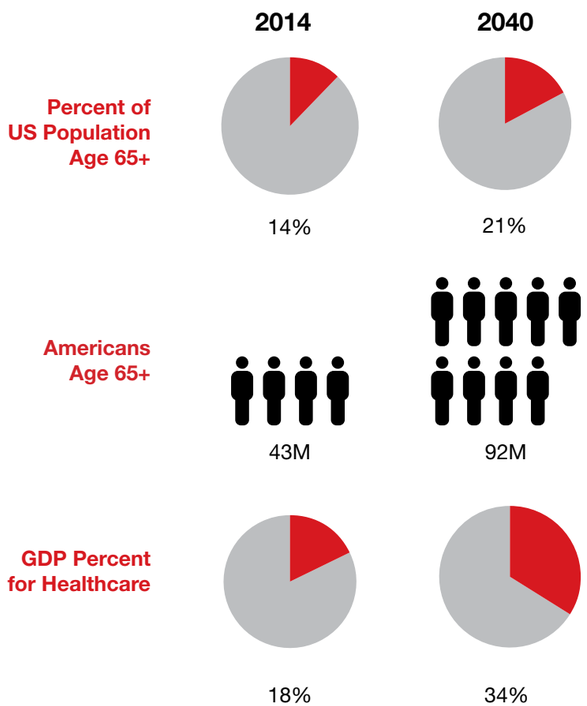
This project was started with the goal of improving quality of life for the rapidly growing aging population. Initial research showed that this demographic segment accounts for the majority of national healthcare expenditures. As the percentage of senior citizens grows, so too will healthcare costs, creating an unsustainable burden on taxpayers unless something is done to keep older adults as healthy as possible.

From a pyschographic perspective, independence and self-determination are incredibly valued by the older population. There is an overwhelming desire among seniors to remain living at home, but this ideal is challenged by their decreasing physical capabilities. Among causes of independence loss, falls represented a sudden but preventable event that dramatically decreased overall quality of life and could lead to premature death.

Although many products exist to mitigate fall risk, like grab bars and non-slip surfaces, these interventions are activity- or location-specific and do not meaningfully increase quality of life. **We realized that by addressing the physiological root causes of falls, like muscular atrophy and inflexibility, we could not only prevent falls, but also improve overall quality of life, both inside and outside the home.**

With this in mind, we saw an opportunity to design a fitness product for older adults. Unlike existing devices, which appear cold and intimidating, our user-friendly solution would incorporate psychological motivation techniques to sustain exercise habits over the long-term, as well as sensor arrays to gather physiological data and feedback mechanisms to guide users through exercises.

THE INCOMING AGE WAVE



VALUE FOR STAKEHOLDERS

Users
Benefit from improved quality of life. Will be strong, more flexible, and have better balance. Reduced risk of falls. Lower healthcare costs. Less impact if a fall does occur.

Healthcare Providers
Benefit from sustained usage. Especially important for ACOs. The number one problem mentioned by doctors for exercise interventions was long-term adherence. Also can use data from product to monitor progress and modify exercise regime.

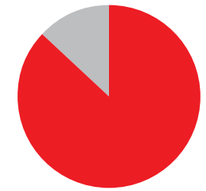
Insurance Agencies
Benefit from lower costs. Healthier cardholders mean less medical expenses.

The American Economy
Healthier seniors result in lower overall healthcare costs. Especially important because of dramatically rising aging population and associated medical expenses.

AGING IN PLACE

“Aging in place is the ability to live in one’s own home and community safely, independently, and comfortably, regardless of age, income, or ability level.”

- US Center for Disease Control



87% of seniors want to age in place

FEARED BARRIERS

53% fear health problems

26% fear memory loss

23% fear mobility issues

INDEPENDENCE LOSS

The inability to perform the activities of daily living is the most common reason that older adults live in nursing homes. Causes ranged from incontinence to dementia, but falls represented a sudden but preventable traumatic event that triggered many other complications.

1 in 3 seniors falls every year

50% of falls occur in the home

25% of those that fracture a hip die within a year

FALL PREVENTION

The CDC cites that exercise is the best technique to decrease the risk of falls. Exercise builds muscle, increases bone density, and improves balance. **Just the fear of falling has also been shown to decrease self-efficacy and contribute to lower quality of life.**

Weekly Exercise Requirements

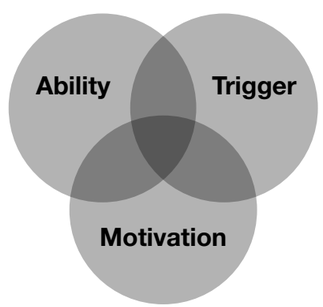
Aerobic Exercise
150 Minutes

Strength Training
2 Sessions

Existing products for fall prevention actually increase the risk of falls. Instead of building physical resilience against falls, they can only contact emergency services for help after a fall has occurred.

“Many of the barriers to exercise are perceptual. People frequently start new exercise routines, but fail to maintain them over time. Research on behavior change showed that we could design a product that sustains positive exercising habits by providing well-timed triggers, motivation, and the ability to execute a desired behavior.”

BEHAVIOR CHANGE MODEL



PRODUCT CONCEPTS

"We are redefining the fitness experience for older adults by creating a smart, user-friendly exercise device that not only improves lower body strength, flexibility, and balance, but also keeps users engaged over the long-term by learning their core values and tailoring motivational messages to resonate with their intrinsic nature."

WHAT'S INNOVATIVE ABOUT OUR PRODUCT?

1. **We combine a physical exercise product with a digital platform.**
2. **Our product guides users through exercises in real-time. It can be morphed to different shapes to accommodate different exercises.**
3. **We gather user data from social media accounts and short surveys.**
4. **We analyze core motivators and tailor specific messages for each user.**
5. **We share information with healthcare providers to create the more effective routines.**

PRODUCT ATTRIBUTES

Variable Resistance

Strengthens Lower Body

Feedback

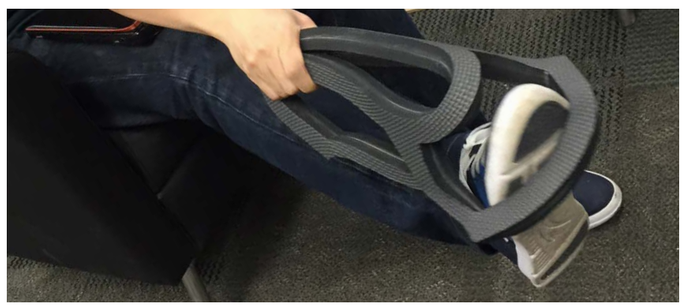
Progress Indication

Connectivity

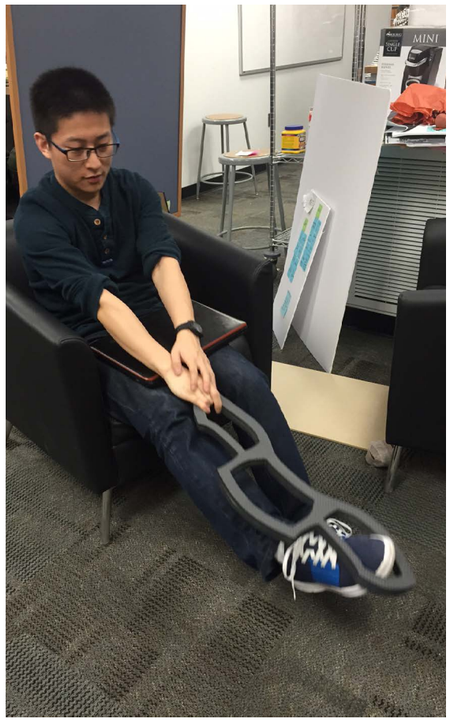
Exercise Guidance

Morphing Shape

Data Analytics



CONCEPT MOCKUPS



WHAT CAN WE DO WITH OUR PRODUCT?

Sustain exercise interventions by creating triggers and motivating users.
Triggers can be alarms, e-mails, or other reminders. Can also create psychological triggers by anchoring exercises with other daily activities, like showering or watching a specific TV show. Messages to the user will be tailored to their core values and intrinsic motivators.

Determine core values of users.
Can analyze data from social media accounts or collect brief survey data. Will gradually evolve core value characteristics over time.

Test motivational messages across a variety of users.
Can perform A/B testing across similar users to determine if certain messages result in better performance. Enables product to continually evolve and adapt its messages for the best user results.

Tailor UI and UX based on learned user characteristics.
Can shift language of messaging or app layout to best suit user needs. For example, menu options may change from "I want to lose 10 lbs" for an externally motivate user to "I want to feel more energetic" for a internally motivated user.

ENABLING TECHNOLOGIES

Variable Flexibility Mechanical Spine
Allows product to morph into useful shapes for specific exercises or products. Imagine a robotic snake that can transform into a dumbbell, barbell, or flexible hinge. Adjustable flexibility enables progressive resistance to increase exercise intensity. Custom design is in progress. Expected to be most difficult engineering task. Completely analog design. Will not require power to change flexibility.

Motivation Algorithm
Allows product to inquire about and learn what motivates a user. May possibly pull data from social media accounts to analyze personality traits and determine potential motivation tactics. Can also gather user information with brief surveys over a long time frame. Determined user motivations will evolve over time, similar to how Netflix recommendations change based on viewing habits. Algorithm is used to tailor messages specifically for each user to sustain exercise intervention over the long-term. Can be integrated with external communication sources, like e-mail or Twitter to remind and motivate users to use the product.

Embedded Sensor Array
Allows product to capture user performance with accelerometers, flex sensors, heart rate sensors, and other basic sensors. Not expected to be difficult to integrate, although this project borders on the field of soft-robotics and may encounter problems with mechatronic system robustness in constant flexion conditions. Will require on-board power.

Feedback Systems
Allows product to guide users through exercise. Will be simple haptic, auditory, or visual cues. Not expected to be difficult engineering task. Will require on-board power.

Wireless Connectivity
Allows product to transfer data to a smartphone or base station receiver. Expected to use Bluetooth standard, although other protocols like ZigBee will be considered. This project aspect can be optimized later. Will require on-board power.

MARKET ANALYSIS

RESEARCH ON THE GYM AND EXERCISE EQUIPMENT MANUFACTURING INDUSTRY

Quick Facts
Revenue in 2014: $1.9B
Projected Growth: 0.5%
Profits: $102.2M
Businesses: 228

Product Segmentation
Cardiovascular Machines: 50.2%
Free Weights: 26.7%
Weight Machines: 15.7%
Other Exercise Equipment: 7.4%

Market Segmentation
Schools / Fitness Clubs: 40%
Retailers: 25%
Wholesalers: 25%
Consumers: 10%

CHOOSING A TARGET USER

Our product will not be successful if it targets the entire aging market of 43M people in 2014. Instead, we have chosen to focus on individuals nearing retirement or recently retired because no longer working represents a major shift in lifestyle, which presents an opportunity to introduce a new product into daily routines. Choosing a 10 year age range is important because users don't physiologically change that much within a span of 10 years. These individuals stand to benefit the most from our product because they have upwards of 20 years of life left.

TARGET DEMOGRAPHICS

Age: 60 - 70
Number of People: 24M
Average Income: $32,000
Gender: Female
Frailty Level: Vulnerable
Bone Density: Below Average

TARGET PSYCHOGRAPHICS

Sedentary lifestyle for several years.
Retired, but possibly seeking second career.
Values time with their families and grandchildren.
Willing to use technology to improve their quality of life.

FEELINGS ABOUT AGING

"I have a feeling of becoming wiser, of expanding in capacity and intelligence with age."
- Rebecca, 64

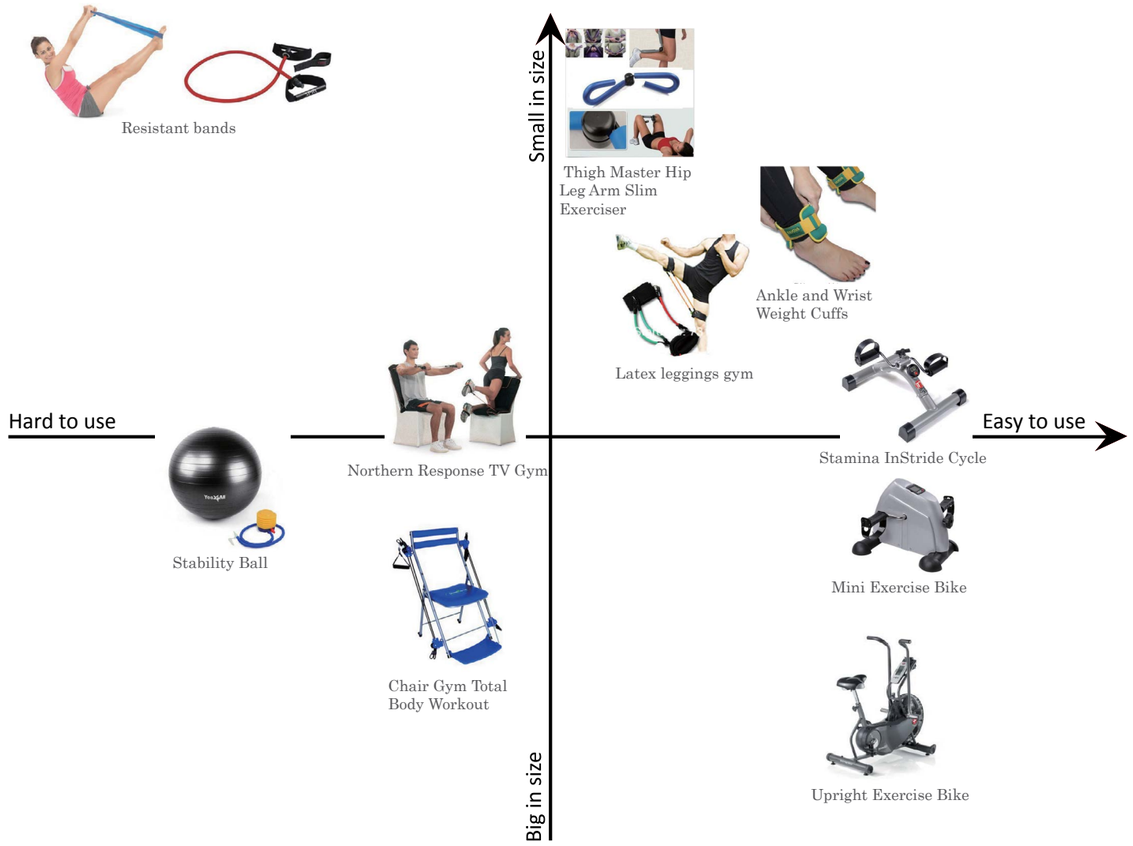
"I still feel I have something to offer, but there's this impatience with my poor performance."
- Victor, 90

POSITIONING STATEMENT

Zenkai is the most engaging way to improve lower body strength, flexibility, and balance among all fitness interventions for older adults because of its innovative motivation-based user experience that builds and sustains exercise habits over the long-term.

COMPETITIVE RESEARCH

There's not much out there tailored specifically for older adults. They represent an ignored segment to the current fitness product industry, but an amazing opportunity and huge market to us. Aside from exercise products, our primary threats are other means of exercise, like fitness clubs and private fitness instructors, although they may also become our biggest ally if they purchase our products.

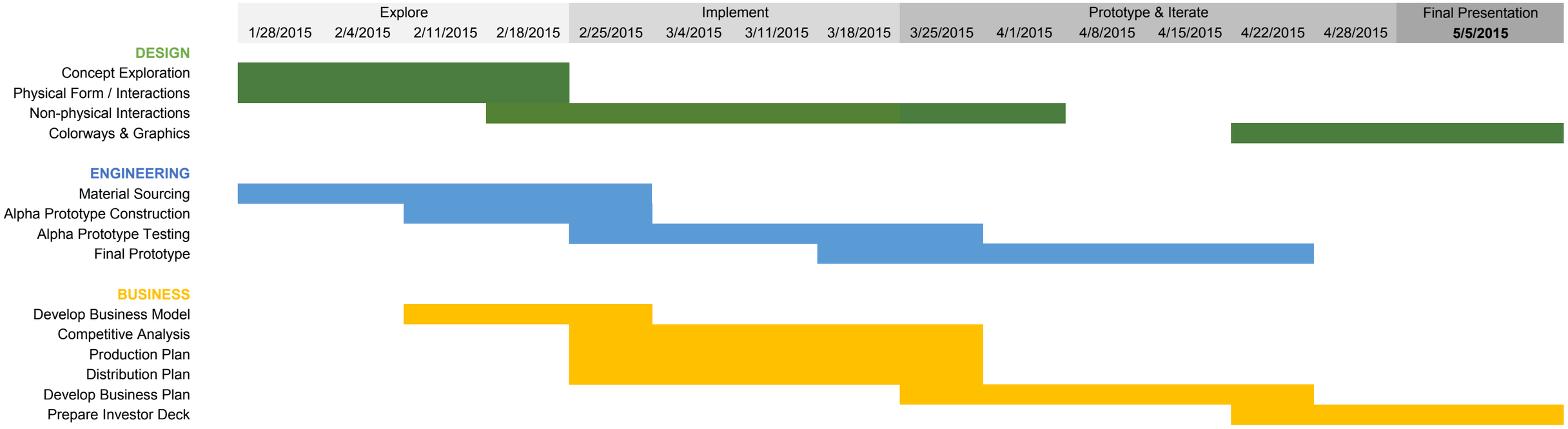


LONG-TERM BRAND STRATEGY

Connect like-minded users.
Our goal is to move beyond functional benefits and create emotional connections with our consumers. By facilitating interactions between like-minded older adults, we can not only address problems of isolation, but also create positive emotional associations with our brand.

Expand product offerings for non-elderly segments.
Although our product was designed for the older adult population, an extreme user group with unique considerations for physical form factor, our concepts can be scaled for mainstream consumers. However, the crux of our brand - the motivation system - would remain the same, but simply inhabit a different body.

DEVELOPMENT PLAN



EXPECTED HURDLES TO OVERCOME

Pricing
Initial target retail cost was $75 and manufacturing cost of $40. Need to further refine product concept to set price point, although we do not want to alienate low-income users, like seniors living on Social Security payments. Price heavily depends on electronics package.

Mechanical Design
The mechanical design of the adjustable flexible spine is novel and is expected to take quite some time. We have addressed this by frequently 3D printing prototypes for testing and further refinement. Another issue is material selection for appropriate fatigue limits and yield strength.

Flexible Electronics
One constraint we expect to face is integrating PCBs into a semi-flexible physical form. We may end up transitioning to flexible printed circuits.

Finding Manufacturing Partners
To keep manufacturing costs low, we want to find manufacturing partners in China or Vietnam. Product quality is very important, so we have chosen countries were we can speak the native language.

DEVELOPMENT COSTS

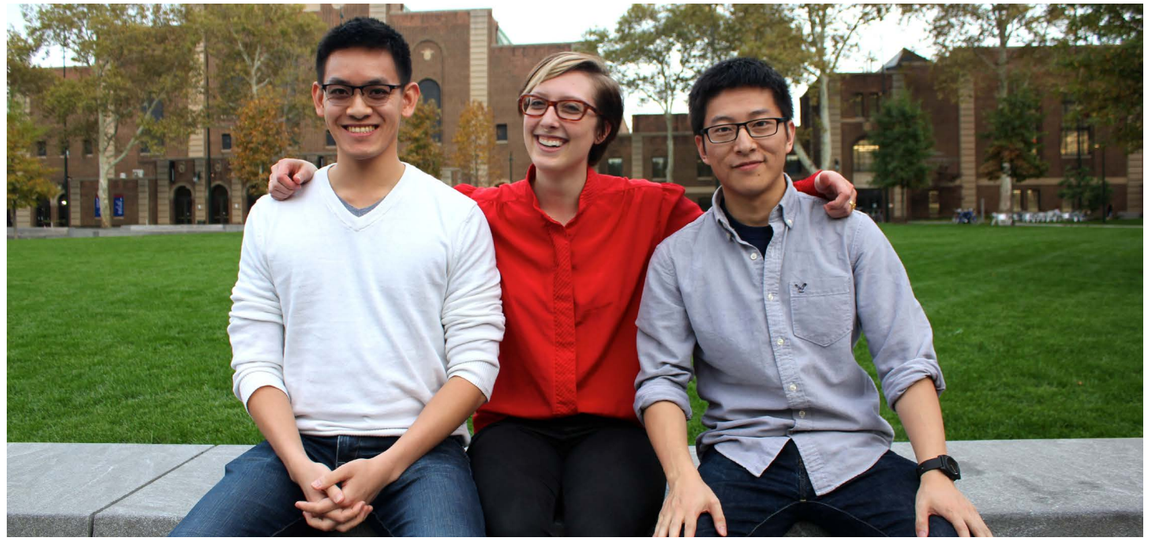
Minimum Viable Product
We have a $1500 budget to develop an MVP by May. So far, we have spend around $300 on prototyping materials and development boards. Parts for a refined pre-production model should cost about $400 from third party vendors. We plan to develop our unique motivation algorithm in-house.

Mass Production
Although the final concept is not yet finalized, comments on initial mock ups have estimated tooling costs upwards of $30,000. This will largely depend on the complexity of our final design. With an estimated manufacturing cost of $40 and minimum order of 5000, our initial investment will exceed $200,000. In the future, we must estimate annual sales to determine our payback period.

Product Roll-out
We will largely depend on in-house created advertisements because of the unique skill set of our team. That means marketing costs will largely be for search engine results. Word-of-mouth marketing will be a large factor in gaining enough groundswell for our product launch. We plan to first increase awareness of our brand among doctors and physical therapists because they are front-line contacts with our intended user group.

TEAM MEMBERS

FOUNDERS FROM THE INTEGRATED PRODUCT DESIGN CLASS OF 2015



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Business Lead
BS in Aerospace Engineering.
Specializes in mechanical design, marketing strategy, and branding.
Branding Designer for UPHS.

Emily Dieckmeyer
Design Lead
BA in Visual Studies.
Specializes in user research, needfinding, and industrial design.
Researcher for the Rehabilitation Robotics Lab in the UPHS.

Zeming Huang
Engineering Lead
BS in Mechanical Engineering.
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MENTORS

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Sarah Rottenberg
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PEOPLE WE'VE INTERVIEWED

Domenick Salvatore
Strength and Conditioning
UPHS

Tal Ben-Shahar
Lecturer on Positive Psychology
Harvard University

Brooke Salzman
Geriatric Medicine
Jefferson University

Kathy Jedrziewski
Geriatric Medicine
Penn Institute on Aging

Victor Bressler
Internal Medicine - Retired
Age 90

Anne Ronne
Nurse - Retired
Age 72

Carol Wamsley
Physical Therapist
Penn Institute for Rehabilitation Med.

Rebecca Narva
Fitness Instructor
Nia Technique

Americus Reed
Professor of Marketing
The Wharton School