

Studying Stigma Within the Physical Therapy and Rehabilitation Field while Examining
the Patient-Physical Therapist Relationship: An Argument for the Introduction of
Industrial Design Practices

by

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ABSTRACT

This study focuses on the patient-therapist relationship in the physical therapy and rehabilitative field. It also studies the concept of stigma that users of assistive and rehabilitative devices face intrinsically and extrinsically. Stigma users of these devices face while going through therapy often leads to device abandonment and regression in rehabilitation. The purpose of this study is to identify the most common types of stigma experienced by these users, to evaluate how patients and therapist interact, and what possible gaps in communication they may have, ultimately to explore the potential benefits of incorporating industrial design practices into the physical therapy and rehabilitative field, in an attempt to alleviate the identify pain points in regards to the aforementioned. A mixed-method qualitative/quantitative approach was taken through the use of survey, interviews, and observational study. Weekly, 2-3 hour site visits to SWAN Rehab in Phoenix, AZ were made to conduct said interviews and observation, while digital surveys were dispersed through multiple online channels. Key findings include that common stigmas experienced by device users are being labeled as “other” or being seen as “less than” by others, and that assistive and rehabilitative devices leave much to be desired. Lastly, the implementation of an industrial designer into the patient-therapist relationship is a route that needs to be explored further. Agile design is a facet of industrial design that may prove useful in this field, but require future research to substantiate. This future research may include applied projects involving a patient, therapist, and designer, where assistive and rehabilitative devices are customized specifically for the patient in question. An ethnographic study is also necessary to gain a deeper understanding of what physical therapy truly entails.

Keywords: Stigma, Patient-Therapist Relationship, Industrial Design

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LIST OF DEFINITIONS

1. Rehabilitative (Technology) Devices:
 1. “[devices] you might need to regain function after an injury or illness and include acute clinical care in the hospital or treatment in a rehabilitation hospital or residential rehabilitation facility.” - (National Disability Navigator Resource Collaborative, 2021, p.1)
 2. “[devices] that use technology to help people with physical disabilities increase their independence.” - (Gale Encyclopedia of Nursing and Allied Health, 2019, p.1)
 - 3.
2. Assistive (Technology) Devices:
 1. “any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.” (IDEA, 2017, p.1)
3. Agile Design:
 1. “The agile design process uses the iterative as well as incremental approach; in this particular process, the system divides the work into small parts and puts the focus on individual parts holistically.” (Educba, 2021, p.1)

4. Stigma:

1. Public stigma involves the negative or discriminatory attitudes that others have about mental illness.
2. Self-stigma refers to the negative attitudes, including internalized shame, that people with mental illness have about their own condition.
3. Institutional stigma is more systemic, involving policies of government and private organizations that intentionally or unintentionally limit opportunities for people with mental illness. Examples include lower funding for mental illness research or fewer mental health services relative to other health care. (American Psychiatric Association, 2023, p.1)

5. Physical Therapy:

1. "The health profession concerned with promotion of health, with prevention of physical disabilities, with evaluation and rehabilitation of people disabled by pain, disease, or injury, and with treatment by physical therapeutic measures as opposed to medical, surgical, or radiologic measures." (Medical Dictionary for the Health Professions and Nursing © Farlex, 2012, p.1)

6. Industrial Design:

1. "Industrial Design (ID) is the professional practice of designing products, devices, objects and services used by millions of people around the world every day." (IDSA, 2021, p.1)

INTRODUCTION

1.0.0 Overview

Physical therapy and rehabilitation is a vast, multifaceted industry. LaRosa provides the statistic that the physical therapy industry was worth roughly \$34 billion in 2022, and is expected to increase to be worth about \$43 billion by 2025 (2022). Despite the projected increase in PT (Physical Therapy) spending, BetterPt points out that there exists a myriad of barriers to access regarding physical therapy and rehabilitation, with a few being high co-pays, lack of education on how to go about getting set-up to receive therapy, and simply not believing that their ailment is “serious” enough to warrant physical therapy (2023). With this being said, it is apparent that costs are exorbitant, accessibility is convoluted, and stigmatization is unfortunately the norm. Long story short, the physical therapy industry needs quite a bit of improvement. One of the common pain points with the PT industry lies with the products associated with it. The products in which are being referred to are assistive and rehabilitative devices. Assistive devices, as defined by the Individuals with Disabilities Education Act of 1975, are, “...any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities” (2017, p.1). According to Gale Encyclopedia of Nursing and Allied Health, rehabilitative devices are devices that utilize technology to provide assistance to those with physical disabilities to help increase their independence (2019). These devices also serve to assist in the actual recovery process through gradual conditioning. The sole purpose of these products are to provide comfort and accessibility to those who cannot achieve it on their own due to personal ailments. It is rather common that user’s have more negative things to say regarding these devices

than positive. And more often than not, they inadvertently bring stigma upon their users, in the sense that they are physically inferior to those without ailments. As defined by the American Psychology Association (APA), stigma manifests itself through three varying channels, with those being public stigma, self-stigma, and institutional stigma (2023). Please refer to the definitions section above for the meaning of each. Shinohara and Wobbrock state, "If assistive devices mark users as "other", this may create social barriers to access even while such devices should help overcome them," which inadvertently serves as a catalyst to the three types of aforementioned stigma (2011). The goal of this research in regards to stigma is to identify the specific realms of stigma experienced by individuals who attend physical therapy and who use assistive/rehabilitative devices, and as a future implication, how might industrial designers work with said users to manufacture a device that dissuades the presence of intrinsic and extrinsic stigmatization.

Within the setting of PT, one of the most common relationships exists between that of a patient and a therapist. This relationship is like that of any other; chemistry is key. Other factors influence this relationship as well. Morera-Balaguer et. al. reports that physical therapists feel that the quality of the therapy provided is contingent upon not only themselves, but rather also depending on the patients' contextual factors, environmental characteristics and the professional aspects of the rehabilitative team. Findings from their study show that a positive relationship between patient and therapist typically yields positive results, while a more mismatched relationship will likely yield undesirable results (2018). This is a simple dynamic that is likely obvious to many. Now, imagine if a third party was added to this existing relationship. This third party would be one that consists of an industrial designer. The current situation is one with a patient who

is looking for a solution that appeals to their personalized situation. A therapist's job is to work with said patient to reach this solution. The solution is often chosen from a predetermined pool of regimens or products that are geared towards fixing the problem at hand. Yes, these regimens and products do in fact work. They have proven to be successful; not without qualm, however. The issue with the majority of these solutions is that they are mass produced; they lack the aspect of personability. Jacobson makes the important point that assistive devices are often designed by mechanical engineers and related technicians, and seldom by an actual industrial designer (2019). The industrial designer's job in this proposed relationship is to act as the bridge between the gap created by the lack of personalization and sensible design that spans between the client and therapist. The primary goal of this research after the data collection and analysis phases are complete is to essentially advocate and properly justify the possible addition of an industrial designer into the patient-therapist relationship. The potential benefits and improvements will be explored, as will the potential cons, and hypotheses for future research will be formulated.

1.1.0 Justification

Jacobson states that assistive devices are almost always designed by mechanical engineers and technicians, and rarely by actual industrial designers (2019). The U.S. Bureau of Labor Statistics defines the job description of mechanical engineers as, "...design, develop, build, and test mechanical and thermal sensors and devices including tools, engines, and machines" (2022, p.1). In regards to industrial designers, The Bureau defines their job description as, "[to] develop the concepts for manufactured products...", and to, "...combine art, business, and engineering to make products that

people use every day.” They further accentuate that, “Industrial designers consider the function, aesthetics, production costs, and usability of products when developing new product concepts.” Just based on the job description of both fields, it is evident that mechanical engineers do not pay much, if not any, attention to aesthetic aspects of designed devices. The main concern is function. While this isn’t necessarily a bad thing, patients who use these prescribed devices are more than patients in this relationship; they are *consumers*. A consumer, as defined by Econlib, is the final user of a product or service (2023). Considering the user of a product is paramount to making one that is successful on all fronts. In other words, it must be user-friendly. Dickmann describes a user-friendly product as one that is carefully designed, while considering who will be using it. He further states that it should be easily learned, easy to utilize, and efficient in achieving its desired purpose. In terms of designing a user-friendly product, the needs, abilities, and limitations of the intended user must be carefully considered. Lastly, and most important in this particular context, Dickmann makes clear that a user-friendly product must be visually appealing, with a design that essentially embodies its intended user (2023). This career conundrum is a prime justification as to why this research needs to be done.

Shinohara and Wobbrock make a very enlightening point, which essentially states that if assistive devices unintentionally denote their users as ‘other’, social barriers to access will arise, which is counterintuitive as these devices are pivotal to making their users lives easier and more inclusive (2011). Alluding to the previous section discussing mechanical engineers vs industrial designers, it was made very apparent that the latter puts miles more effort into aesthetic nuances than the former. Using that same logic,

designing a product for a marginalized user group must make them feel the opposite of just that. Meyerson states it very well. In summary, he poses the question, “When you’re shopping for something, would you prefer to buy a product that is stylish or unattractive?”. He goes on to state in a hypothetical fashion that most people would obviously choose the stylish product, if it works as well as the unattractive one. It is then stated that most of the products on the market aren’t very attractive at all, and it is concluded that designers usually focus more on functionality and neglect aesthetics, which has been actually proven to be due to the fact that these “designers” in question are actually mechanical engineers (2021, p.1). These unattractive devices guide potential users in the opposite direction when making purchases; they don’t want something that attracts negative attention. People are social creatures who desire affirmation and acceptance. Choosing a drab, chunky, cumbersome device will cause the user to start applying a degree of self-stigma, which will ultimately cause them to stop using the device in the long term. This is also a very strong justification as to why this research is essential to this field.

1.2.0 Scope & Limitations

This study consists of a handful of limitations that will keep the subject matter simplified and contained, preventing it from becoming overly saturated with excess areas of study. As it stands, the study will be focusing on static or sedentary devices, meaning that they do not possess electrical or digital components. Consider splints, slings, arm and leg braces, manual wheelchairs, crutches, etcetera. This will serve as a starting point where product architecture is simple to identify and become familiarized with, while also having the potential to be rebuilt or redesigned through rapid prototyping methods,

which TWI describes as the quick fabrication of a physical part utilizing Computer Aided Design software, and ultimately using additive manufacturing methods, such as 3D printing (2023).

Working off this type of logic, it is safe to say that bionics and sensor-based prostheses are excluded from study. This type of technology requires heavy electronics and complex sensory systems, which will only serve to convolute the study beyond what is necessary at the moment. The last limitation to this study is the limit of mental ailments. While mental health and physical therapy/rehab do go hand-in-hand, mental ailments require extensive psychological expertise that the researchers involved with the study do not possess. Parekh defines mental illness as, “health conditions involving changes in emotion, thinking or behavior,” or a combination of the three (2018). While stigma is a mentally associated issue, the concept of stigma is something that can be tangibly explored through interview and survey. It does not require a diagnosis to be attributed to an individual, which is why it can successfully be examined in this study.

1.3.0 In Terms of Stigmatization

As stated previously, stigma is a common issue faced by those who use assistive and rehabilitative devices. This stigma lies in, according to Hocking (1999), and similarly Jacobson (2019), users’ perception of themselves as being physically disabled. People typically tend to try to fit in as much as possible to avoid social tension or ridicule. Assistive and rehabilitative devices often draw unwanted attention to the user by emphasizing attributes related to a disability (Brooks, 1991). The array of articles that have been examined in preparation of this introduction have all shared the same ideals.

At this point, it is clear that it is a widespread issue amongst all stakeholders involved. It affects the patient's rehabilitative progress, it affects the patient's family and friends when they decide not to use their devices as prescribed, and it also affects the therapist working with the patient, as progress can not be made if the proper measures are not taken, thus backlogging the therapist and potentially harming their relationship.

Conducting research on ways to design assistive/rehabilitative devices in a way in which they either mask the disability being tended to, or appeal to the user's personal desires is without question a necessary endeavor. Eliminating stigma anywhere it exists in society is a great service to those residing within.

1.4.0 In Terms of a New Patient/Therapist/Designer Relationship

A common design relationship is that of the Design Triad, explained in great detail by Giard (2012). This consists of the Designer, Maker, and User. It's rare, and likely impossible, to have only two of the stated parties in a relationship. You cannot solely have a Designer and Maker; who will use the product? You cannot have solely a Maker and User; who will design the product? And you most certainly cannot solely have a Designer and User, who will make the product? This dependent relationship may be similar to that of a patient and therapist. In this case, it is not as dependent as the Design Triad. It is obvious that this relationship is self-sufficient, but studies show that it is far from optimal. There exists a gap between patients and therapists, with the gap being a lack of personalization and design. Crits-Christoph's et. al. study demonstrated how patients trust and respect their therapists based on a variety of variables and scenarios (2019). Consider a scenario where the patient does not feel the rehabilitative device their therapist has prescribed them is doing its specified job. The patient claims

that the sizes they have tried are either too tight or too loose. The therapist then replies that those are the only two sizes that accommodate the patient's body. What happens next? Well, nothing particularly productive. Now imagine the same scenario with a third member to bridge the gap between what currently exists and what can potentially exist. This third potential member is of course an industrial designer, and a stronger case is expected to be made once research and analysis has taken place.

1.5.0 Expected Outcomes

After data is collected through interviews, observations, and ethnographic immersion, it is projected that pain points and qualms will be identified regarding patients' experiences with their rehabilitation, specifically in terms of the devices they use, and the perceptions they have upon themselves within society, as a user of said devices. It is also anticipated that feedback regarding their relationships with their therapists and other involved parties will be received. This data is crucial to the justification of the implementation of a possible third member into the patient/therapist relationship, one who may possess a skill set to assist in solving and correcting some of the aforementioned pain points.

LITERATURE REVIEW

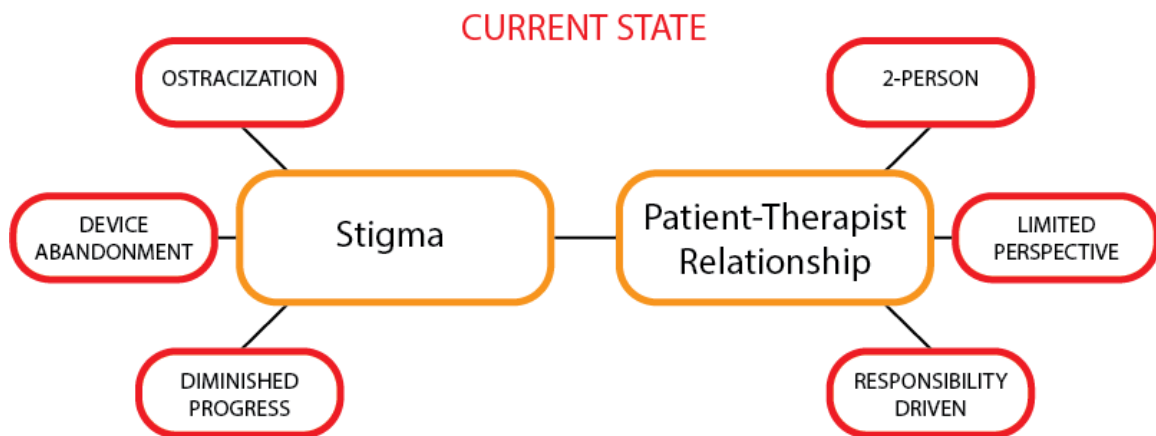
2.0.0 Overview

The literature in the related fields demonstrate a need for a re-evaluation of the PT and rehabilitative field and the relationships within it. The following literature review explores the topics of the perceived stigmatization of those who use assistive and/or rehabilitative devices, and the hypothetical relationship between patient, therapist, and designer.

2.1.0 Conceptual Framework: Pre-Study

Figure 1

Conceptual Framework 1/6



Depicted above is the first phase of a developing conceptual framework. There are currently two categories with both having three sub-categories attached to it. The first of which is stigma, with it containing the aspects of ostracization, device abandonment, and diminished progress in terms of therapy regimens. Anderson provides the main four responsibilities of a physical therapist, with those being diagnosis of physical impairments in clients, creation of treatment plans and regimens, provision of

physical treatment, and education regarding self-care (2023). This highlights the addition of the “responsibility driven” category. While there are multiple entities involved with the overall physical therapy process, only the patient and therapist share a high level of personal interaction. Standard physical therapy sessions last roughly an hour, with some lasting only 30 minutes, and others lasting longer, claims Alliance Physical Therapy Partners (2022). It truly appears to be a 2-party interaction. This is what may be called the Rehabilitative Dyad, or the current state of physical rehabilitation.

Figure 2

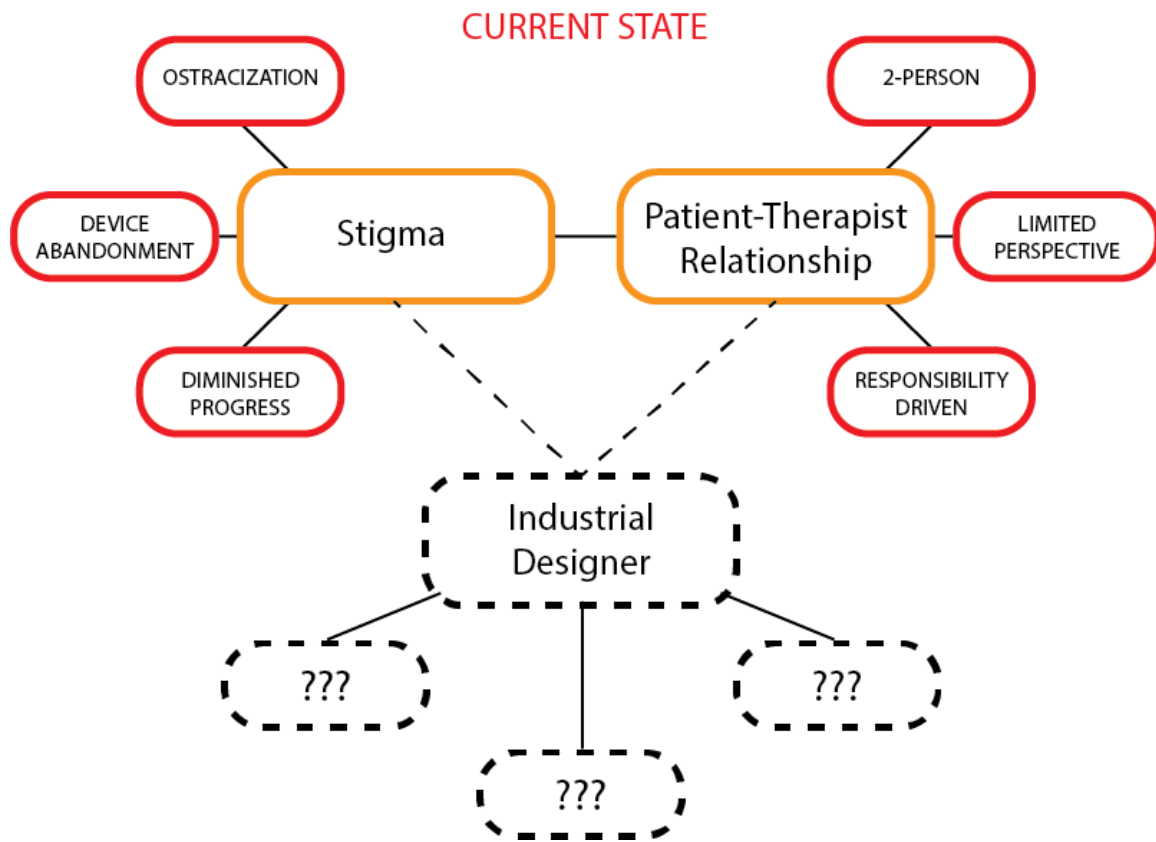
The Rehabilitative Dyad



Sud refers to a dyad as something with two elements or parts that work together, with one of those elements typically being a participant or patient, and the other element being a person they have a relationship with, and in this case, that is the therapist (2019). This diagram shows a two-way flow, with only two stops, one on either end of the diamond. This represents the limited communication between patient and therapist. If something is said, it ends up on the other side, and a response is then provided. There are no outside opinions providing their insight to help assist with the physical therapy. This also means that there are limited diverse points of view that have the opportunity to provide insight and solutions to certain issues a therapist couldn't solve on their own.

Figure 3

Conceptual Framework %



Now, consider a third a member of this dyadic relationship. A possible third member that possesses abilities and skills that neither a physical therapist or patient could provide to the scenario. A few of the key listed issues within this dyad are device abandonment, limited perspective on solutions outside the clinic, and the diminishment of therapeutic progress throughout the prescribed PT regimen. What this conceptual framework aspires to become is one that incorporates an industrial designer into the conversation, who may have the ability to address some of the pain points described above and in earlier sections.

2.2.0 In Terms of Stigmatization

2.2.1 As the User

Stigma is most often created and manifested by the person experiencing said stigma. This has been defined earlier as self-stigma. In terms of users of assistive and rehabilitative devices, stigma is frequently manufactured as a result of the self-generated belief that one is labeled as “other”. Paraphrasing the words of Scambler, stigma is characterized by rejection, devaluation, blame or exclusion that ultimately results from past experiences, current perceptions, or reasonable anticipations of an adverse social judgment or misguided assumptions about a person or group (2009). It is this “perception” that drives the self-inflicted stigma that these users face. It all goes back to the concept of identity. The people who use these devices may have used them for the majority of their lives, or they may have been in an unfortunate accident, or are subject to a degenerative illness that have caused them to use them later in life. Either way, both of these scenarios play a fundamental role in the user’s identity. Whether they have always been seen as “vulnerable”, can no longer complete the tasks they once could, or have had major lifestyle changes as a result, their identities have been ultimately compromised. Another basic premise of stigma, as described by Papadimitriou, is simply that one’s own perceived worth can be assigned or inferred on the basis of an external attribute or characteristic (2008). This simply means that, if one uses a device such as a wheelchair or walker, then they are automatically going to be viewed as one who is “disabled”, or “lesser”, or part of a minority. As a species, humans are defaulted to seek social acceptance; not a single person truly wishes to be casted out on their own. Scientific literatures focused on social tendencies of humans have collectively reflected

that humans desire status; it is a basic human motive. It can be surmised that individuals care strongly about the respect they receive from those who they interact with, and they will spend large amounts of time managing their status (Anderson, Hildreth & Howland, 2015, as cited in Anderson and Hildreth 2016). With this being said, no one wishes to be placed into an unfavorable group, or labeled as such. It goes against the fundamentals of human nature.

2.2.2 As the Observer

From the outside looking in, stigma associated with assistive and rehabilitative devices is just as prevalent as stigma created by the actual user. Interesting takeaways have been noted from a study conducted by a group of researchers, specifically focusing on Kenyan perceptions (Barbareschi et. al. 2021). For the first rather unfortunate takeaway, it was found that the majority of youth in the study believed that those who are disabled were needier than those who are not, and are subsequently a burden because of that. Furthermore, respondents made other statements such as those who are disabled cannot make substantial contributions to society, that they cannot assume certain occupations, that being disabled is a result of being cursed, or that it is inherently a result of being reckless or engaging in unwise activities. Assistive devices are often used by those who are physically disabled, so by association, those who utilize assistive devices are seen in a dominantly negative way. While the majority of responses were negative, there were positive remarks sprinkled throughout the interview process. It is also crucial to note that this example is quite unique, as it is through the lens of youth in a developing country. In terms of a more generalized world view, Jones et. al. reports from a meta-analysis of a systematic review that disabled youth are more than twice as

likely to have experienced some form of violence than their peers who do not have discernable disabilities (2012). This essentially proves that those who use assistive and rehabilitative devices are substantially more susceptible to bullying and mistreatment from others in their respective social circles. It is also said that stigma is a social construct, and that the attitudes and environments of others essentially create "barriers of discrimination" and accessibility, and not necessarily the actual physical impairment as stated by Fine and Asch (1988). On many occasions, it's what is unsaid that causes the most harm. The shortcomings in inclusion regarding those who use assistive devices is also apparent due to the increase in PR advertisements regarding related manners. Take the *Canadian Tire "Wheels"* advertisement that premiered during the 2016 Summer Olympics. The premise of this ad is that a boy moves into a new neighborhood, who happens to use a wheelchair. He observes the other kids playing basketball, and has a longing expression on his face. One of the boys notices this, and invites him out to play following this observation at a later time. When they arrive at the court, all the kids are on office chairs and scooters, so the boy in the wheelchair can feel included in their game. The ad ends with all the kids having a great time playing their new, inclusive version of basketball together (Canadian Tire, 2016, 00:00). The media nowadays is filled with similar types of advertisements, some blatantly advocating for inclusion of and equality for the disabled, and some that lightly touch on the subject by simply including people who are physically and mentally disabled into said advertisements, as a means to subtly drive home the fact that those who are disabled, or who use assistive and rehabilitative devices are just like those who are not users of said devices.

2.2.3 Failures in the Designs

It has been made abundantly clear through user reviews and anecdotes that the aesthetics of assistive and rehabilitative devices are heavily lacking. As pointed out by Jacobson, assistive devices are largely designed by engineers, not industrial designers (2019). This is a major pitfall in the assistive/rehabilitative device Industry. While engineers possess the skills to make a product “work”, they often lack the capabilities to make a product aesthetically pleasing, as mentioned before. This forte belongs to that of an industrial designer. Wearing a device that appears cumbersome, one that lacks design sensibilities, is likely to draw attention to the user, and, as a result, further solidifies their cognitive disposition that they are indeed an “outcast”, strengthening the prevalence of stigma. Gaffney points out a “psychosocial factor”, predominantly found in Western culture, that ultimately leads to device abandonment (2010). It harkens back to one’s physical appearance when using said devices, and how these devices affect the users perceived social acceptability (Hocking 1999). Western culture is highly concerned with the concept of upholding appearances and one’s image in society. This is why we buy clothes that make us look attractive or of high status, the same goes for the cars we purchase and jewelry we wear. If a person wears an assistive device, they are likely to assume they are of lesser social value, mainly due to the implications it creates. The fact that the majority of these devices lack personalization and customization options, and are typically all black, nylon, velcro, utilitarian products further creates an association to a certain group, or minority. This notion is further supported by the following quotation; “[v]ery rarely will an assistive device be an accessory that demonstrates personal choice, taste, or social fashion” (Brooks 1991, p.1417-1424). According to a study titled “Aesthetics and the perceived stigma of assistive technology for visual impairment”,

aesthetics do in fact play a considerable role in the adoption and acceptance of assistive devices by their users. It was concluded that devices without detrimental symbolism but with modern-day aesthetics, such as smart glasses, were more positively accepted by the participants in the study than the device with a more dated, out-of-touch aesthetic and symbols of visual impairment, such as the white cane (Dos Santos ADP et. al, 2020). It further states that *designers* should pay close attention to the aesthetic nature of these products when designing them. This is an interesting statement, as it has already been made apparent that product designers rarely have a hand in the design of assistive and rehabilitative devices, at least traditionally. This further advocates for the push of said devices to be designed, at least, initially by product designers, and handed off to mechanical engineers to make them functional.

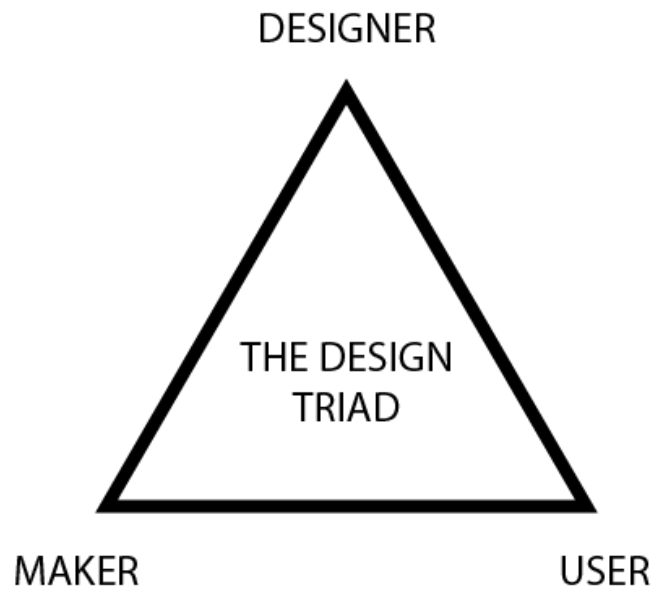
2.3.0 In Terms of a New Patient/Therapist/Designer Relationship

2.3.1 Designer, Maker, and User (Design Triad)

As Giard states, designing takes place amongst the three key participants (Giard 2012). These three participants being the Designer, Maker, and User. There are then more specific interfaces between each of the participants, with those being pairs of the aforementioned. It then goes even further with the additions of the artifact and context into the scenario. However, the focus will be put primarily on the relationship between the three participants. Despite there being specific interfaces between any two of the participants at any given time, designer, makers, and users ultimately work as a trio, because they have evolved from being one sole entity, into, "...three separate but interdependent entities."

Figure 4

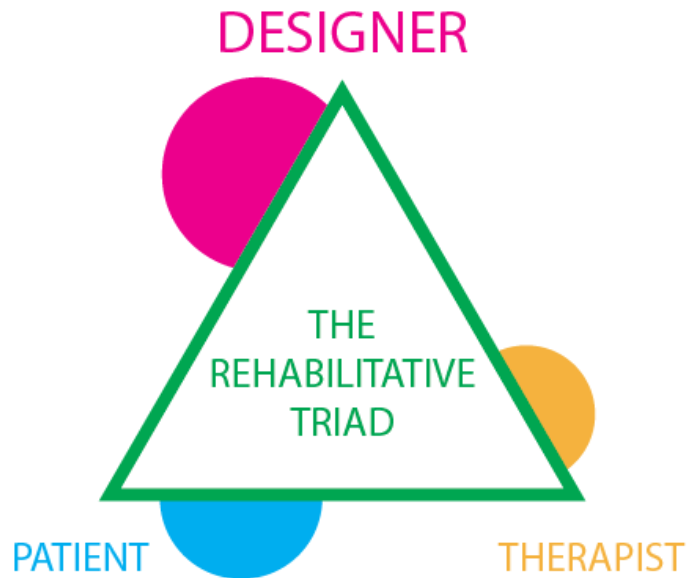
The Design Triad



The relationship does not exist in a realm of two; there will always be a designer, maker, and user in any given relationship, even if one party claims multiple roles. This is foundational to the art and process of design. Now, consider the same type of relationship, a triad, in the realm of the PT field, specifically in the area of physical rehabilitation. Within this scenario, the predominant interaction exists between a patient, one who is seeking aid in rehabilitating their current state to a previous level of capability, and a physical therapist, one who has the ability to provide said aid to the client in need. This is a dyad, and while the nature of a dyad has its benefits, there exists untapped potential in the transition to a trio. The proposed third member in this relationship is none other than an industrial designer.

Figure 5

The Rehabilitative Triad



In the following sections, *Regarding the Therapists & Regarding the Patients*, the existing relationship will be explored through two lenses, in greater detail, and the potential benefits of adding an industrial designer into the mix will be discussed.

2.3.2 Regarding the Therapists

As it currently stands, the primary relationship in the physical rehabilitation space is between the physical therapist and the patient. The two parties spend the majority of their time together, working towards a better quality of life for the patient. However, the current state of the patient undergoing therapy, the improvements expected by those involved, alongside the therapist's own expectations tend to render physical therapists vulnerable to various different kinds of stress, states Alesii et. al (2005). Being the primary source of guidance, comfort, and support, a considerable amount of pressure is placed on the shoulders of therapists, literally and figuratively. The study goes on to find

that the quality of patients' lives and, therefore, outcome, are affected by the accumulated stress on the therapist's behalf. With someone's well-being and progress being the sole responsibility of one therapist, stress is bound to be built up. This two-party relationship has the potential to fail, if the stress grows to be too much. PTs, as a study conducted by Mary O'Keefe et. al. points out, "A mix of interpersonal, clinical, and organizational factors are perceived to influence patient-therapist interactions..." (O'keefe et. al. 2015, p.609-622). The third component that was perceived to influence the aforementioned relationship is individualized, patient-centered care, which essentially means listening to and acknowledging patients' opinions, and utilizing them to some degree in their therapy regimen. Not all therapists are going to be stellar communications, nor will they always be able to prescribe the best treatment plan for their individual clients. Treatment plans are created utilizing the physical therapist's medical expertise, and what they have concluded regarding the patient's scenario, states CORE 3 (2023). There will be times when a plan is prescribed, and a device is issued, and there may be qualms with the issued device. These gripes and complaints from the patient may not be solvable by the therapists. This is where the introduction of a product designer may prove to be beneficial to the overall relationship between the two parties. Having an industrial designer utilize design processes has the potential to yield results unobtainable if it were just a therapist approaching the issue. Fard describes a process used in a more modern design setting, known as the agile design process, as an approach that is iterative in nature, with the steps being to understand, research, sketch, design, prototype, test and lastly, refine (Fard, 2020). With this specialized, nuanced skill set possessed by certain designers, a therapist will be able to have a sense of security knowing that there are possible solutions to a problem that they can't inherently solve on

their own. Designers are also capable of designing systems. When a therapist is planning out a rehabilitation regimen for a patient, a designer can provide their input from a different, yet insightful, perspective. This is rooted in a specialized type of thinking, known as design thinking. The term was coined by the infamous design consultancy, IDEO, and is essentially a process for identifying and solving problems by making the user's needs top priority. It relies on observing and empathizing with how people interact with their personal and societal environments, and utilizes an iterative approach in an effort to innovate much needed solutions (Tuttle, 2021). Encouraging therapists to adopt a design thinking mindset has the potential to make various improvements in the field. Introducing a designer into the mix is the first step, and through exposure and continual application, physical therapists should be able to design a plan, try it out, ask for patient's feedback and input, revise said plan to meet the most crucial needs of the patient, enact the plan, and adjust as necessary.

2.3.3 Regarding the Patients

It is apparent that the more vulnerable party in a patient-therapist relationship is the patient. Barstow explains the power differential, which is the innate power discrepancy between patient and therapist with the latter having more default power over the former (2015). Patients are the ones seeking assistance with their ailments, and asking for help is often a difficult task for many. It has also been made clear that those who use assistive or rehabilitative devices face a large amount of self-imposed and outside stigma. With all of these variables, patients need to establish a positive relationship with someone who will listen to them unconditionally, and work to better their overall situation. This someone is a physical therapist. It is paramount that PTs possess

certain traits to better prepare themselves for fostering positive relationships with their patients. Loomis lists five essential communication based factors that are found within a favorable patient-therapist experience, with those factors being active listening, friendliness, empathy, trust, and motivation” (2023). They also add that patients, “...want to share their story.” The hardships they face and are facing shouldn’t be brushed aside or dismissed in any scenario. However, considering the time patients and therapists spend with one another, it is likely that, in some scenarios, a therapist and patient may become no longer compatible, depending on the chemistry between the two or events that occur. Veilleux paints this situation well, as she explains that, “The job of the therapist is to use yourself as an instrument,” and to, “...be aware of how you (your instrument) reacts” (2019, p.1). This is through the lens of psychotherapy and counseling, but runs parallel to that of physical rehabilitation. The fact is, both parties are human, and humans possess a wide variety of emotions and nuanced perspectives. However, the patient is the one seeking a service, and the therapist is the one providing said service, so the therapists bear the responsibility of maintaining the professionalism of the relationship, and ensuring that progress is being made. This does not excuse unsavory behavior from the patient, but it should be expected that a patient may be acting out in an emotional way, due to the pain, distress, or a mix of both, and it is likely expected by the patient that the therapist take their emotions full force without retaliation. This is, of course, the worst scenario possible, and further research will need to be conducted to confirm this statement. Nevertheless, the patient’s well-being and recovery are the main priorities in this exchange. As of now, the patient-therapist relationship can be classified as a commensalistic one, meaning that one organism benefits while the other organism isn’t receiving any sort of benefit or harm (Nguyen, 2021). There are also

times when patients feel they aren't truly being listened to, and that those leading their recovery regimen are assuming and telling them what they need. Megan Cary describes the pros and cons of having two best friends. It is not being said that a patient-and therapist should be best friends. The two scenarios are being equated to show the possible benefits of having a third individual in the patient-therapist relationship. The two cons Cary points out are the prevalence of jealousy and insecurity, and how someone is always going to be stuck in the middle of a disagreement. These two proposed drawbacks may hold true for a friend-friend-friend dynamic, however, the scenario being analyzed is one that is a matter of both business and the betterment of the patient involved. With this, the pros of having a third friend, or in this scenario, a product designer, in the relationship include, "having a peacemaker"(Cary, 2015). Now, this should not be taken at face value; the industrial designer is not here to act as an emotional mediator, nor as a psychologist, and most certainly not as a best friend. The proposed industrial designer should act as a problem solver and ideator, helping the therapist and patient brainstorm suitable solutions to their problems that deal with what devices to consider prescribing, how to modify existing devices to meet the patient's needs, or to conduct research on other routes that can be taken, as it pertains to assistive and rehabilitative devices.

METHODOLOGY

3.0.0 Overview

This research revolves around two core research topics. Each research topic serves to create specific research questions, which then creates specific research goals that will be constantly worked towards, ultimately in pursuit of an expected outcome which is paramount to alleviating the pain points and missed opportunities that lie within the physical therapy and rehabilitation field, specifically relating to the areas regarding stigmatization and the relationship between patient and therapist.

3.1.0 Research Topics

As stated previously, the two topics that will drive this research are as follows:

- The existing relationship between patient and therapist.
- Perceived stigmatization of those who use assistive/rehabilitative devices and those who do not.

These two topics are explored in more detail in the following sections.

3.1.2 Stigmatization

- What are the most common stigmas associated with those who use assistive/rehabilitative devices by society?

There exists a wide variety of stigmas that people who use assistive and rehabilitative devices face. Ranging from ideas that they are less than an abled bodied person, that they cannot do as much as an abled bodied person, that the quality of the things they do are of lesser quality, or even the complete opposite, that the things they do are more impressive and bear more importance to that of an average person. Knowing exactly which stigmas they face the most will provide a clearer image of what needs to be rectified through the research that is to come.

- What stigmas do users of assistive/rehabilitative devices think are placed upon them by others in society? What stigmas do they hold to themselves?

This is similar to the previous question, but goes in a slightly different direction. It focuses more on the two parties involved, the user of said devices, and those who perceive those who use said devices. Regarding the users, it is important to identify their thoughts and perceptions on their situation, to grasp a better understanding of the stigmas they associate with the use of these devices. Regarding those in society who interact and perceive the users of these devices, it is equally important to obtain their perspectives. It can be argued that it is even more detrimental for an observer to place stigma upon a group from the outside. Getting these perceptions and assumptions recorded and analyzed is paramount to devising an efficient solution to the virus that is stigmatization.

- How does personalization/customization of assistive/rehabilitative devices affect perceived stigmatization from both mentioned parties?

This question revolves around a proposed, hypothetical solution. It assumes the angle that adding personalization options and customizability to assistive and rehabilitative devices will lessen the stigmas around them. This is believed to be the case more so in the eyes of the user, rather than those observing. The notion that a user of a device is likely to want to use it more and be more comfortable using it if it showcases their personality and likes is to be tested here. While it is hypothesized to be a lesser effect, observers may also change their perspectives on a user of an assistive or rehabilitative device if it is more aesthetically pleasing or less cumbersome. If this is actually the case is uncertain, which is exactly why it is crucial that it be tested through thorough research and analysis.

3.1.3 The Patient/Therapist Relationship

- What are the main interactions between a patient and therapist?

Knowing exactly what goes on between a patient and their therapist day-to-day is the first step into understanding their relationship. Pinpointing the exchanges between the two that are most successful, and not as much, can bring to light the miscommunications that may be occurring.

- Where is the disconnect in communication (if any) between patient and therapist?

Similarly to what was mentioned above, identifying any lapse or disconnect in communication between the patient and therapist can aid in devising a solution to mitigating the potential for future miscommunications.

- What are the pros and cons to introducing an industrial designer into the patient/therapist relationship?

This is the realm in which experimentation may occur during this research. After identifying the disconnects in communication, and shortcomings in interactions between the two parties regarding their regimen or devices, an industrial designer may be implemented into the relationship, forming a triad and adding another link to the bond. Then, observations can occur, focusing on the effects of adding an industrial designer into the mix has on communication between the patient and the therapist, and the overall success of the treatment.

3.2.0 Research Approach

Regarding the research approach, a mixed method strategy will be the most beneficial. Based on basic assumptions, the situation at hand is highly characterized by pathos. When discussing stigma, a variety of emotions come into play. Whether it be shame, guilt, inferiority, a sense of “otherness”; the list goes on. Streefkerk states that one should use qualitative research if one wants to understand something, on a more personal level (2022). Qualitative research, at its very core, “enables you to gather in-depth insights on topics that are not well understood.” For the users of assistive and

rehabilitative devices who are facing stigmatization, sitting down and taking the time to listen to their anecdotes, asking questions about their experiences, and walking through their daily routine with them is the single most effective way to obtain the data that is being sought after. In terms of the relationship between patient and therapist, qualitative research will also be the most suitable. This lies in the fact that qualitative research is analyzed simply by summarizing, categorizing and interpreting the obtained data, as described by Streefkerk. Interviewing the duo and observing their typical banter will uncover blatant and not so blatant quirks and dynamics in their relationship. With this, certain categories can be developed, and preconceived notions and assumptions can be differently interpreted, in an attempt to create a solid foundation on what the current relationship is, and what a possible relationship could look like if an industrial designer is introduced.

Now, in terms of quantitative, this type of research, as described by Streefkerk, is used to test or confirm formulated theories and personal assumptions. At its most basic definition, it revolves around numbers and graphs. This realm of research will assist in all aspects of this thesis exploration, similarly to qualitative.

3.2.1 Interview

“The goal of academic research interviews is to obtain rich, nuanced data that can provide insights into complex social phenomena or contribute to theory development.” (Clements, 2021, p.3). Whether it is a patient or therapist, each party holds valuable information regarding rehabilitation, the devices involved, perceived stigmas, and the relationships affected by everything that occurs. Four therapists and five patients were interviewed utilizing structured interview style with set questions,

which can be referenced at the end of this document (see Appendix A). Below are a few subjects that were explored in the interviews conducted.

3.2.2 Survey

“Questionnaires [surveys] are a very useful survey tool that allow large populations to be assessed with relative ease” (Baxter et al, 2013, p.1). The main reason to utilize a survey in this research is to reach a large number of participants with ease, as stated in the referenced article. Surveys were generated and distributed through various channels such as reddit, facebook, and by hand. A total of 9 surveys of the first type were completed, which was substantially less than what was expected. Unfortunately, no responses were received of the likert-scale, which was quite surprising. With this being said, the ones that were received were analyzed for possible themes, commonalities between the devices used and how users feel about said devices, and what these users would like to see in the future when it comes to assistive and rehabilitative devices. The surveys used will be located at the end of this document (See Appendix A).

3.2.3 Observational Study

“The term observational research is used to refer to several different types of non-experimental studies in which behavior is systematically observed and recorded” (Chiang et al., 2017, p.1). Sitting and watching allows for a, “...snapshot of specific characteristics of an individual, group, or setting...” to be taken. To go even deeper, there also exists both disguised and undisguised observation, which is just as it sounds. In one variation, the researcher is hidden to the participants, to view the subjects in their natural environment without any kind of influence on their actions. Undisguised

observation typically occurs when it is unethical or impractical to observe without consent. For this research, an undisguised approach was taken, as a researcher sitting and observing a group of people undergoing their daily routine should not influence the data very much, if not, at all. SWAN Rehabilitation was visited once a week for about 7 weeks for 2-3 hours at a time. When interviews were not being conducted, the researcher sat and observed the interactions between patient and therapist, the devices used, words that were exchanged, the types of exercises done, and demographic details.

3.3.0 Sampling Strategies

In terms of sampling strategies, two types of approaches will be taken. Please see the following sections.

3.3.1 Convenience Sampling

“Convenience sampling is a method of audience sampling where researchers select participants through any means available, such as sending a survey link to all your email contacts or asking passers-by on a busy street to answer a few questions” (Hillman, 2022, p.1). This method was used in both the interview and survey phase of the research. As stated before, surveys were sent through various channels, to ultimately receive no responses. In terms of interviews, any and every patient and therapist were available to be interviewed. Participants were not chosen based on any demographic criteria, but as they appeared in the clinic. This way, bias was avoided and the potential number of participants increased.

3.3.2 Random Sampling

“The goal of random sampling is simple. It helps researchers avoid an unconscious bias they may have that would be reflected in the data they are collecting” (Gaille, 2017, p.1). Unconscious bias can skew data, and skewed data is unreliable data. Engaging in a random sampling method alongside other methods can be used to increase the validity of a study, by limiting confounding variables and respondent bias. The types of questions posed in the survey included respondents’ exposure to rehabilitation, their knowledge regarding assistive devices, their perceptions of those who use said devices, what they know about stigma, and their relationships with those who use assistive and rehabilitative devices.

3.4.0 Analysis Methods

In terms of analysis methods, three types of approaches will be taken. Please see the following sections.

3.4.1 Grounded Theory Analysis

“Grounded theory is a qualitative method designed to help arrive at new theories and deductions. Researchers collect data through any means they prefer and then analyze the facts to arrive at concepts. Through a comparison of these concepts, they plan theories. They continue until they reach sample saturation, in which no new information upsets the theory they have formulated. Then they put forth their final theory” (Mathur, 2021, p.1). Composing a theory is one of the main goals of researching a thesis topic. Collecting data, analyzing said data, and making sense of the results is a long, drawn out process; justifiably so. If one desires to develop, and ultimately support a

theory, they must go through all the proper channels as a prerequisite. Taking what researchers may discover about assistive device users, their therapists, the activities involved with therapy, what have you, can lead to the formulation of a profound theory that may very well have the potential to revolutionize the physical therapy and rehabilitation field. Conceptualizing new relationships and foundations that exist between the patient and the therapist is one such endeavor this research strives to address. Applying Jacques Giard's concept of the design triad to the aforementioned relationship is an experiment in of itself, which has the potential to yield an interesting theory that can further be tested for validity. Grounded theory was also used to develop the addition of an industrial designer theory as well, which will be discussed in the following chapters. The generation of theories, especially in what may be considered a new avenue of a well-established profession, is the much needed framework to the eventual construction of a new way of engaging in the related activities associated with physical rehabilitation and assistive tech.

3.4.2 Narrative Analysis

“Narrative analysis is a type of qualitative data analysis that focuses on interpreting the core narratives from a study group's personal stories” (Kaluza, 2023, p.1). Through this type of analysis, more insight can be gained into the topics of stigma; why these users of assistive devices feel the way they do about themselves and their situations, or maybe why they think others see them in the way they think they do. Regarding therapists, analyzing their anecdotes utilizing narrative analysis techniques sheds some light on the potential disconnects they may or may not have with their

patients, or even what areas may be lacking in their daily procedures dealing with rehabilitation regimens.

3.4.3 Content Analysis

“Content analysis is a research tool used to determine the presence of certain words, themes, or concepts within some given qualitative data (i.e. text). Using content analysis, researchers can quantify and analyze the presence, meanings, and relationships of such certain words, themes, or concepts (“Content Analysis”, 2022, p.1). After obtaining multiple personal accounts and reviewing the transcripts of anecdotal evidence from respondents, each has been reviewed within the context of themselves, and then in a broader context amongst one another. Uncovering the similarities and trends that each holds possesses the opportunity to unveil a deeper connection that may be happening behind the scenes. Consider the topic of pain points associated with assistive devices. Reviewing anecdotal evidence from users of said devices presents parallels amongst certain types of devices. Identifying these commonalities is pivotal in determining what are the true pitfalls with these devices. Stigma has also been analyzed through content analysis, primarily based on how many times certain words were said in relation to other key words. This will be discussed in the next section, Research Findings & Data Analysis.

RESEARCH FINDINGS & DATA ANALYSIS

4.0.0 Overview

The primary location of the research conducted was at SWAN Rehabilitation in Phoenix, AZ. Permission was received by the business owner and CEO to conduct research at the facility in the form of observational studies and interviews.

Image 1

Therapist and Patient Using Exercise Bike



The Arizona State University IRB department granted approval for said research to be carried out. Site visits occurred weekly, spanning about 2 months. During these visits, therapy sessions were observed and recorded through physical notetaking. After each observed therapy session, the patient and therapist involved were asked if they would be willing to take part in a brief interview. Consent forms were signed if they were willing to participate. Each interview took roughly 10-15 minutes to complete. Each

respondent's identity was protected and classified, with each respondent being referred to as Patient (Variable) or Therapist (Variable). In the following sections, please take some time to examine the findings related to the aforementioned topics in Chapter 3. Due to the nature of the timeline of the research and unforeseen circumstances that had occurred, only topics with substantial evidence and data will be discussed.

Image 2

Patients and Therapist Playing Rehabilitative Game



4.1.0 Demographics

Figure 6

Gender of Physical Therapy Patients

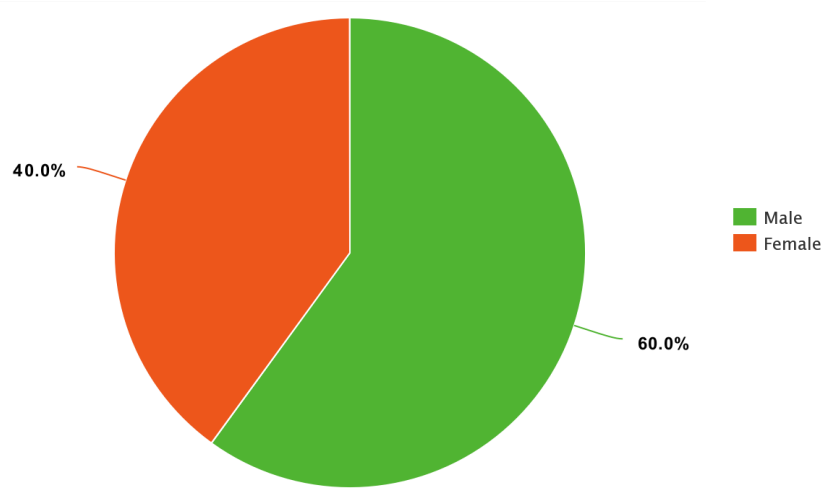


Figure 7

Age of Physical Therapy Patients

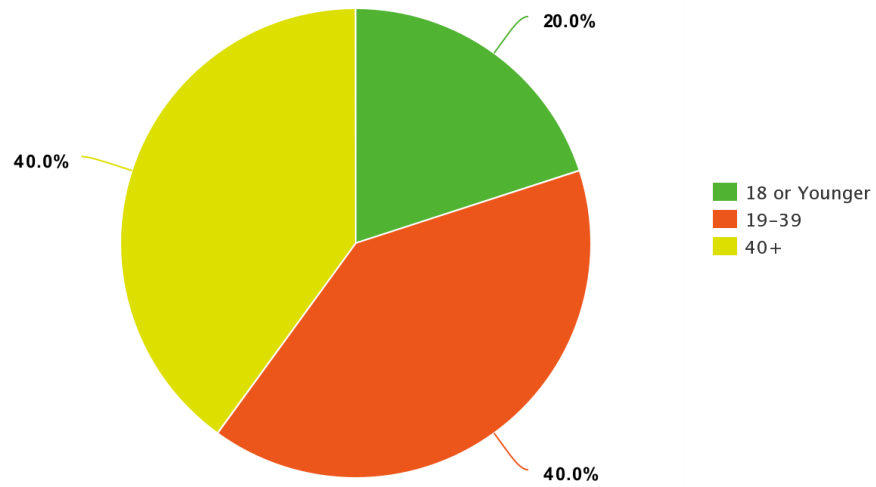


Figure 8

Gender of Physical Therapists

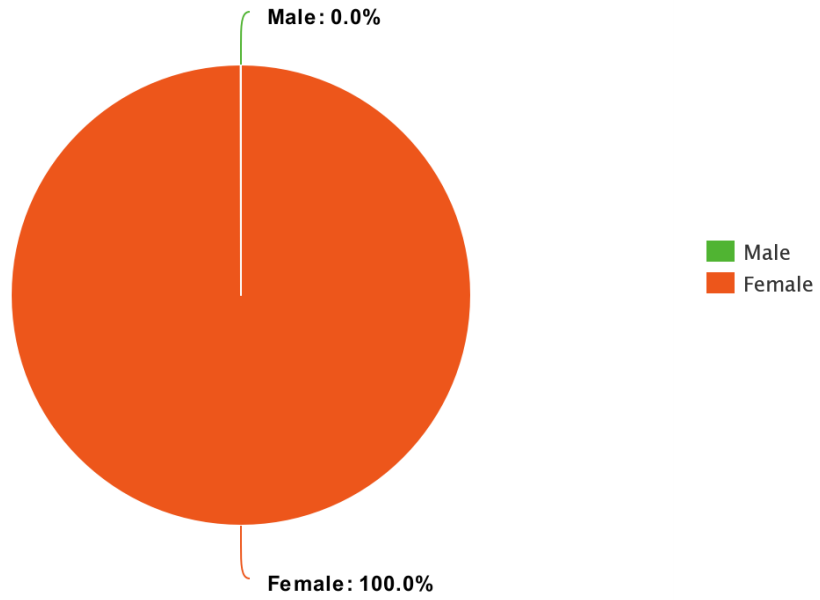
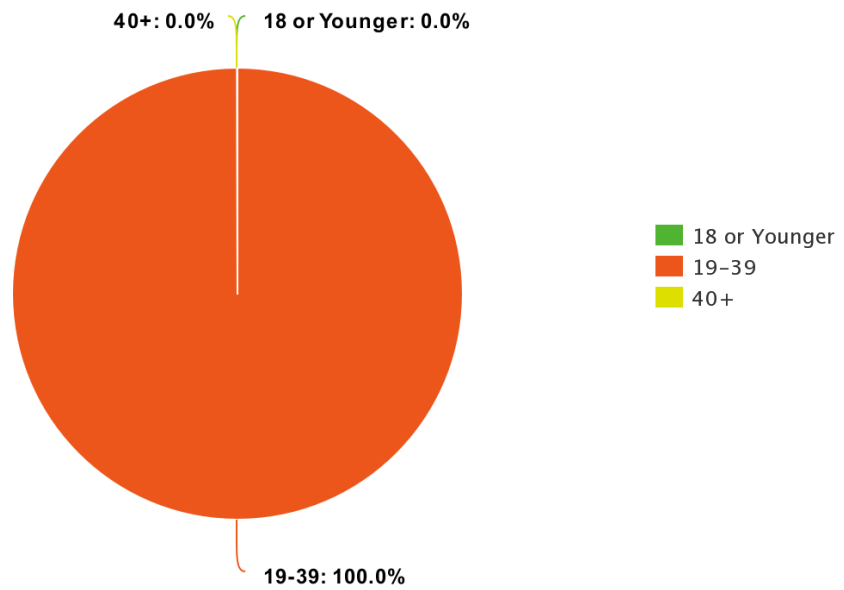


Figure 9

Age of Physical Therapists



4.2.0 Concerning Stigma

A large portion of the interview questions, specifically meant for the patients, were geared more towards their personal experiences and relations with their respective ailments and assistive devices. With this, the topic of stigma came up quite a bit.

Table 1

Patients' Perceptions on Stigmas Associated to Assistive/Rehabilitative Devices

Patients' Perceptions on Stigmas Associated to Assistive/Rehabilitative Devices					
Patient #	Demographic	Device?	Stigma/Self	Stigma/Others	Details
1	Elder Female	Walker	Yes	Yes	Perceives self as "less than", feels others may feel the same way.
2	Elder Female	None	None	None	None
3	Young Adult Male	Sling	Yes	Yes	Self-acceptance is difficult, believes others see them as "handicapped".
4	Young Adult Male	Wheelchair	None	None	Feels very optimistic about their situation.
5	Young Male	None	None	None	Feels very optimistic about their situation.

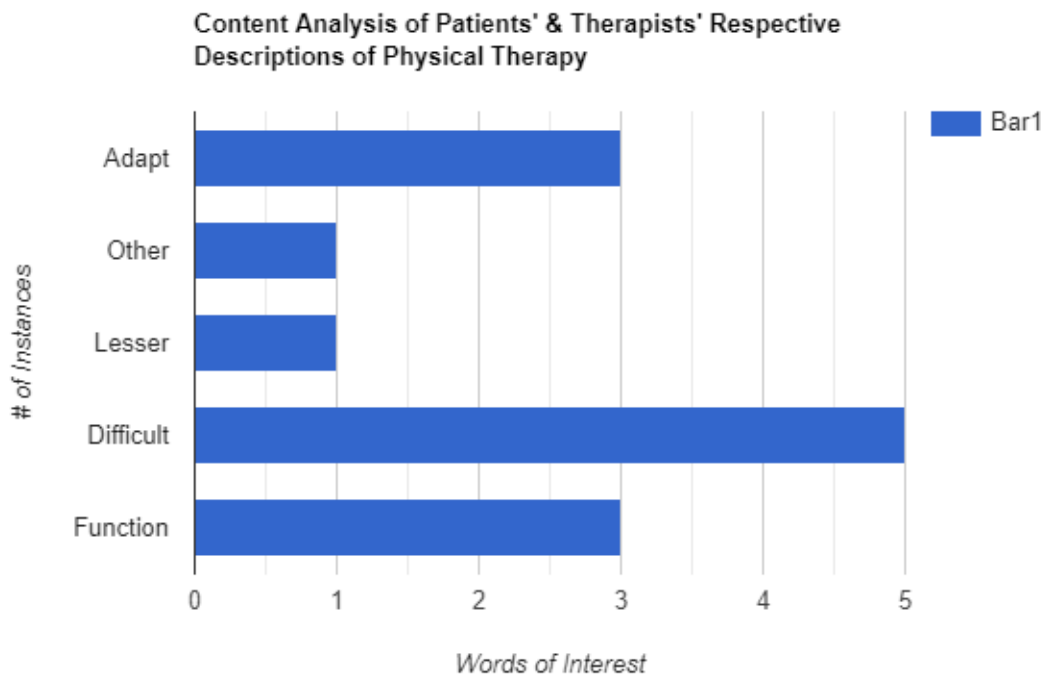
Young = 18 or Younger Young Adult = 19-39 Elder = 40+

Analyzing the interview responses conducted with a handful of patients from SWAN using content analysis, it appears stigma, or the idea of stigma, associated with their current condition is present with 40% of the respondents, with the remaining 60% not experiencing any sort of stigma. Inclusion in this study was not necessarily based on if the interviewee was currently using a device, or if they ever even used one before. The purpose was to identify any and all stigma experienced by patients in a rehabilitative setting. With this being said, 2 of the 3 respondents who do not recognize or experience any stigma do not use an assistive or rehabilitative device. This checks out, as these patients do not have a device that attracts unnecessary attention to them on a day to day basis. There is little to no catalyst of producing stigma by either party in this scenario. The 1 respondent who uses a wheelchair and faces zero issues from perceived stigma seems to be a unique case. Further research with a larger sample size would be necessary to further test this relationship. As for those who do face internalized and externalized stigmatization, a common stigma shared between the two is that of

being labeled as “other”, or “less than”, as identified through content analysis. This is a method to measure self stigma, as these are patients’ opinions about their personal situation.

Table 2

Content Analysis of Patients’ & Therapists’ Respective Descriptions of Physical Therapy



Being categorized with such a negative connotation is bound to be detrimental to a patient’s mental and emotional well being, which is the primary effect of stigmatization regarding the utilization of assistive and rehabilitative devices. Other words that were mentioned that could be used to formulate themes regarding stigma and the patient-therapist relationship include “Adapt”, “Difficult”, and “Function”. These words were mentioned by both patients and therapists, and were typically used in a way to describe the current state of patients. Patients must consistently adapt to new devices and regimens, while therapists must consistently adapt to patients’ requests. This is

often a “difficult” task to complete, with the limited bodily “function” of the patients. Through this content analysis, the overarching theme of struggling seems to be prevalent in the patient-therapist relationship, moreso through the lens of the patient. Having to constantly adapt and change perspectives all in an attempt to regain mobility can be daunting for both parties.

4.3.0 Therapists’ Opinions on Existing Devices

Table 3

Opinions Regarding Assistive/Rehabilitative Devices on the Market

Opinions Regarding Assistive/Rehabilitative Devices on the Market			
Therapist #	Pros	Cons	Details
1	Yes	Yes	Ambulatory devices have come a long way. Hand/Arm deices lacking; too bulky.
2	Yes	Yes	Technology is great; wheelchairs are advancing. Getting quality tech to patients is hard; insurance barriers.
3	Yes	Yes	Some are helpful, others are bulky, expensive, and difficult to set-up.
4	Yes	No	Many options and easily available (Amazon).

Therapists must be experienced and well-versed in the various assistive and rehabilitative devices on the market in order to provide the most effective solution/supplement to their patient’s situation. Four therapists at SWAN were interviewed, and one of the questions was “*What is your overall opinion on the assistive and rehabilitative devices available on the market today?*” The responses to this question vary, with the pros and cons being close to a 50/50 distribution. Pros, as described by therapists, include the evolution of ambulatory devices, improving technology, and accessibility (through entities like Amazon). The cons consist of certain

types of devices, such as hand and arm devices, lack sophistication, getting quality tech to patients can be tough (barriers caused by insurance), and devices being bulky, expensive, and difficult to set-up. It appears that there are some shared and opposing opinions regarding availability. On one side, it seems that certain cheap, commonly used devices can be easily obtained through e-commerce sites such as Amazon. When it comes to more personalized, higher-complexity devices, these can be more difficult to get into the hands of the common patient, mainly due to cost and lack of insurance coverage. With this being said, either legislation needs to be put into place to direct insurance companies to revise their stipulations, in order to make the necessary devices more readily available to all classes of patients, or these devices need to be re-designed in a more affordable and repeatable way. Referring back to section 2.1.3, a solution to over-designed devices lies in that of 3D printing. This type of technology is rapidly evolving. These highly expensive devices may very well see cheaper, yet reliable alternatives through the means of agile industrial design and 3D printing manufacturing.

4.4.0 Therapists' Insights on the Existing Patient/Therapist Interaction

Referring back to section 2.3.1 to the quotation from Giard, "...three separate but interdependent entities," a parallel was discovered between this phrase and a remark that was made by therapist 2 during an interview. The question was, "*Is there anything that you would change about the patient-therapist interaction? Is it fine the way it is?*"

The insights provided by therapist 2 allude heavily to the implementation of a multi/interdisciplinary clinic approach to rehabilitation. They mentioned the need for a neuro/ortho combination clinic, where both types of ailments can be efficiently addressed. They also stated that it would be ideal if there was more interaction between

psychological services and physical therapy, as one usually usually receives less attention than the other, when they both have a direct influence on one another. The last remark that truly draws the parallel between Giard's Design Triad and the provided insights is that therapy clinics should be "interdisciplinary". In a sense, Giard's interpretation of the Design Triad identifies three primary participants, these being the Designer, Maker, and User. These three entities are always present, even if one person or thing embodies multiple, or all entities.

Image 3

Patient Undergoing Physical Therapy for Arm Function



You can not have one without the other. When therapist 2 brought up the idea of “interdisciplinary” work within the physical rehab space, a connection was immediately drawn to the Design Triad. Therapists can not perform all the tasks and duties that are asked of them by their patients, for example, altering an existing device to better suit their personal needs. An interdisciplinary physical rehabilitation workspace could include people like engineers or, in the case of this research, an industrial designer to help achieve and realize these desires of the patients being served. Cross-pollination or education is an inevitable by-product of this interdisciplinary work style, where designers can learn from therapists, vice-versa. It is also obvious that the patient is included in this triad, as they are akin to the User. However, they can also fulfill the role of designer through the principle or act of Co-design. While this one instance is compelling, it is the only instance out of four interviews that provides such insight. The other responses relate more to dealing with family members of the patient during therapy, and the idea of communication and addressing expectations of the patient early in treatment, as opposed to later.

4.5.0 Survey Analysis

Table 3

Personal Experiences with Assistive/Rehabilitative Technology

	Rehab Assistive, or Both?	+	-	Assistive Device	Rehab Device	Assistive Device Comments	Rehab Device Comments
Survey 1	Both			Night Guard	Crutches	Tailor fitted, hard to clean in small spaces	Durable
Survey 2	Both			Walker	Ankle Brace	Takes up a Lot of space	Not physically appealing, easy to clean

Survey 3	Rehab				Tongue Depressor		Wood material, students don't like taste, form is not optimal
Survey 4	Both			Protective Lenses	Flexbar	Difficult to stay motivated to use when younger, made it harder to see sometimes	Great fitment, Durable, confusing at first
Survey 5	Rehab				Wrist/Hand Brace		Fit well and comfortable Smelled bad and hard to clean
Survey 6	Both			Wrist support	Walking boot, Bicep wrap	Fits great, durable	Great fit, durable, easy to clean
Survey 7	Rehab				Wrist brace		Durable, but uncomfortable
Survey 8	Rehab				Fracture Boot		Snug fit, very durable and easy to wash, could be too tight sometimes, bulky
Survey 9	Rehab				Crutches		Uncomfortable and chose to limp, durable and easy to clean

After analyzing the open-ended survey responses, it appears that the distribution of positive and negative comments was 50/50. Content analysis was used to select the top five most common descriptions of the reported devices, with them being “Durable” with six mentions, “Comfortable” (or synonyms) with 3 mentions, “Uncomfortable” (or synonyms) with 3 mentions, “Easy to Clean” with four mentions, and the fifth word or phrase is shared by a handful of interesting comments made by the respondents. These comments paraphrased include:

- Choosing to limp because of discomfort and inconvenience
- Sometimes braces can fit too tight
- Never broke and easy to take apart
- Never cleaned it
- Difficult to stay motivated
- Confusing at first
- Appearance is made for old people
- Tailor-fitted

These last few phrases offer some valuable insights. The fact that a user chose to limp because their prescribed device was too inconvenient to use is alarming, which provides a reasonable amount of support for the incorporation of customization to particular devices. The fact that it was difficult for one user to stay motivated as a child to keep wearing their protective lenses points to poor design. The Flexbar product was confusing at first to use, which could be solved by providing clearer instructions. Lastly for the negative remarks, one respondent stated that the device they were prescribed to use looks like it was meant to be used by old people. This is an obvious comment on the aesthetics of the device, which further supports the need to introduce an industrial designer into the physical therapy setting. On a positive note, the night guard user mentioned that it was tailor-fitted to meet their needs, although this is the nature of what a night guard needs to be, as teeth are extremely unique when it comes to shape and distribution.

It is also interesting to note that out of the nine respondents, nine rehabilitative devices were used while four assistive devices were used. Based on this sample

population, rehabilitative devices are more commonly used than assistive devices, though a much larger sample size is needed to make any sort of conclusion.

DISCUSSION/CONCLUSION

5.0.0 Introduction: Discussion

With the research and analysis phases complete, open-ended conclusions can be drawn in regards to multiple research questions mentioned in chapter 3. To recall, the two overarching components of this research include the following:

- Perceived stigmatization of those who use assistive/rehabilitative devices and those who do not.
- The effects of introducing an industrial designer into the patient/therapist relationship.

Through interviews, surveys, and observational studies, insights and remarks that both support and refute the thesis topic were discovered. While not all research questions were successfully explored or answered in the two-given semesters, enough information was gathered to both answer general inquiries regarding the topic, and further align future research endeavors onto the proper path, which will be discussed in the future research section below.

5.1.0 Conclusions Regarding Topic: Perceived Stigmatization of Those Who Use Assistive/Rehabilitative Devices and Those Who Do Not

The next area to be examined is that of perceived stigmatization. Research questions that have been substantially explored will be discussed in the sections that follow.

5.1.1 What stigmas do users of assistive/rehabilitative devices think are placed upon them by others in society? What stigmas do they hold to themselves?

According to the responses obtained through the interviews with the patients, there are stigmas associated with having a disability or using an assistive/rehabilitative device. While the sample size of respondents was considerably small, firm conclusions cannot be made without conducting further, extensive research. Despite this, certain assumptions and theories can be made and formulated when performing future research. With this being said, It is apparent that those who are younger in age, and those who do not use any assistive/rehabilitative devices do not face, or are sometimes not even aware of stigmas associated with using the aforementioned. This leads one to believe that stigma is directly associated to the devices used by those with physical ailments, and the ability to be aware of or experience said stigma is dependent upon age, the latter, however, is a loose association. Two out of three young interviewees had very optimistic outlooks on their situation, while one of the two elder interviewees were unaware of any stigmas associated with their physical situation. It must also be noted that this elderly respondent was not using, nor have they ever used any assistive/rehabilitative devices. The respondents who were aware of the stigmas, or faced said stigmas personally were all users of assistive/rehabilitative devices. The two stigmas identified through the performed interviews were the lack of self acceptance, and the possibility of being labeled as “other” by those in society. Their feelings and perspective on self acceptance and being labeled as “other” are consistent with the ideas and opinions proposed by Shinohara and Wobbrock. Consequently, it appears that stigmatization is real and projected both intrinsically by those experiencing the physical ailment, and externally by observers upon the former, and that it is a real problem in the

physical rehabilitation field. It can be concluded that the concept of stigmatization needs to be addressed within the physical therapy and rehabilitation field, as it pertains to assistive and rehabilitative devices.

5.1.2 What are the most common stigmas associated with those who use assistive/rehabilitative devices by society?

This was briefly mentioned in section 5.2.1. Self-acceptance and labels are the two stigmas that came up during the research phase. The concept of pride was also mentioned by one of the therapists briefly during an interview, more directed to those who are older in age and have lost the ability to do a specific bodily function. To say that these are the most common stigmas experienced by those who use assistive and rehabilitative devices and those who observe users of said devices is not a statement that can be made. This data can only provide an insight into what the most common stigmas may possibly be. A definitive result can not be garnered at this time.

5.2.0 Conclusions Regarding Topic: The Effects of Introducing an Industrial Designer Into the Patient/Therapist Relationship

The final area to be examined is that of the effects of introducing an industrial designer into the patient/therapist relationship. Research questions that have been substantially explored will be discussed in the sections that follow.

5.2.1 What are the main interactions between a patient and therapist?

After discussing with nine respondents, with five being patients and four being therapists, it has been made very clear the daily interactions experienced between the

two. The main interaction being hands-on therapy and assistance. Therapists observe patients both visually and physically while conducting their routine. Whether it be helping the patients complete a provided task or providing massage therapy, therapists are constantly working with their patients on a very close level. Therapist 1 made the comment that wear-and-tear is placed on their bodies in this line of work. So physical strain is a by-product of daily therapist-patient interaction. Patients and therapists also exchange pleasantries and share stories about their past experiences and daily lives, so a personal connection amongst the two parties has been observed. Although, while the majority of the exchanges between patient and therapist are observed to be either nonchalant or positive, there have been occasions, as discovered through the interview process, where patients and therapist do not see eye to eye. One particular example is described by therapist 2, where they were working with a characteristically headstrong patient who was described as being “pushy” and “constantly butting heads” with them. This occurred early in the therapist's career, so they were more likely to be less in command of the matter, though it was through this experience where the therapist learned to match the patients' power and work through the regimen with them and ultimately obtain a compromise between both party's needs. So it can be concluded that interactions between therapist and patient are essentially common interactions that occur between humans. In regards to introducing an industrial designer, the assistance that they may be able to offer is that of device alteration to possibly appease some of the desires made by the patient that the therapist couldn't meet by themselves.

5.2.2 Where is the disconnect in communication (if any) between patient and therapist?

This answer to this question has been made very clear, as the disconnect in communication between the majority of patients and therapists comes from the unrealistic nature of patient goals and expectations. For example, therapists 1, 2, and 4 made remarks of patients expecting unrealistic results from therapy, such as walking again like they once did before. This can lead to upset or unmotivated patients and discouraged and agitated therapists. Another form of miscommunication comes from the barrier between cognition levels of some patients. As therapist 1 states, aphasia, a comprehension and communication disorder, can make it difficult to communicate with a patient who has this disorder. The same conclusion goes for those who are non-verbal; therapists need to get creative in their ways of communication. Lastly, age and hearing level can affect communication success rates. Now, would an industrial designer be able to directly affect the communication between a patient and therapist? This can only be inferred at this point, but another party in the exchange can serve as a mediator, or the referral of certain products to improve hearing can be provided for those who are hard-of-hearing, however, evidence is limited due to the absence of an industrial designer to observe in this scenario.

5.3.0 Design Implications

The purpose of this research was to gain insight on how industrial design can improve physical therapy and peripheral services. Physical rehabilitation in America is a convoluted subject, and one that is criticized by all social classes alike. Affordability is the main concern for those who have lower incomes, while wait times and access to medications are often the area of concern for those who have higher incomes. These gripes, however, are not exclusive to either group. If industrial designers could insert

themselves into this area of the physical therapy and rehabilitation field, chances of change are likely to be high. With the use of evolving 3D printing capabilities, assistive and rehabilitative devices can be made on a larger scale, with customizability being at its peak. Not only can devices be customized, but also re-designed for a cost next to zero, if being compared to the current standard in modern day society. Designers with an attention to aesthetics can transform the dull, cold, cumbersome designs out in the market today into “fashion statements” that would want to be worn by those with disabilities and body limitations. A very specific design practice may prove pivotal in achieving these goals, and that practice is known as agile design. Agile design according to Educba is a design process that, ...uses the iterative as well as incremental approach; in this particular process, the system divides the work into small parts and puts the focus on individual parts holistically.” (2021) Essentially, design goals are partitioned into small, 2-3 weeks sprints where concepts may be tested out and either implemented or scrapped. This design practice is used to explore a myriad of solutions using rapid ideation and prototyping by taking user feedback and applying it to future iterations. Please continue reading for a brief introduction on one the most crucial design implications for this research topic.

5.3.1 Proof of Concept

The business world typically associates agile product design with software development. However, agility can be practiced in literally any field where a deliverable is required. Vinodh’s et. al. examination of a traditional pump-manufacturing company proves that this is the case (2009). The company was instructed to select a few of their commonly utilized components; in this case, they were the pump casing and impeller.

After applying agile principles and employing empirical equations into the CAD software, 4 new configurations of impellers and casings were developed as a result. Utilizing a FDM 3D printer, a presentation-ready prototype was developed in a matter of 2.25 days, as opposed to the standard 6 days without agile design practices. This is just one example of agile design reducing product development time by over half.

5.3.2 Agile vs Waterfall

Within the business realm exists a variety of project management strategies. Among these include both the Agile method, and more traditionally utilized, Waterfall method. Latoya Morris describes the Waterfall method to be, "...a sequential approach", where "...the next phase can proceed only if the previous stage has been completed" (Morris, 2022, p.1). In contrast, she defines the Agile method as being, "a team-based approach that emphasizes rapid deployment of a functional application with a focus on customer satisfaction. It defines a time-boxed phase called a sprint with a defined duration of two weeks." These definitions are widely accepted, and each method has its perks. Though, as time persists, agile is starting to be more widely adopted as the norm. According to the 15th Annual State of Agile Report, 94% of surveyed companies are practicing Agile, with 65% of those surveyed having significant experience with Agile (Digital.ai, 2021). Now, one might ask, why is the Waterfall method on its way out? Well, it's not that cut and dry. The Waterfall method is better suited for larger projects that span for longer periods of time. Benefits to this methodology include defining the entire project scope, completing project requirements early on in the cycle, and the creation of a complete schedule. The shortcomings lie within the fact that it is rather difficult to receive complete project requirements, as many of the individuals involved haven't considered

all the things they may need, and these things consistently change throughout the course of a project. Also, this method requires a highly detailed breakdown of deliverables, which isn't all that feasible for project teams this early on in the project (Sherman 2015). Referencing the 15th Annual State of Agile Report once more, a few of the challenges that lie in carrying out Agile include "inconsistencies in processes and practices, cultural clashes, and general organizational resistance to change." It appears that Agile's most prevalent flaw is simply that it is difficult to implement, not because it is flawed in of itself, but due to the attitudes of the traditionalists who swear by other methods, such as waterfall. The Agile method allows for increased value to be delivered to both the business and the customer, with greater customer satisfaction being reported, and the speed at which the final product is delivered to the client has also been shown to have been increased as a result.

5.3.3 Applied to UI/UX Design

Agile design is dominantly known to be associated with software development and UI/UX design. In recent years, agile processes have been increasingly adopted over the traditional waterfall methods, and have been proven successful. Hajbos describes the main goal of a UI/UX design sprint is to, "...always provide developers with the materials to work well in advance, including usability testing and gathering feedback from users and customers" (2018, p.4). The primary focus of agile design is to complete quick design sprints, typically spanning a couple of weeks, with the purpose of presenting the concept to the users, to ultimately receive feedback on what is working and what is not, to then allow the design team to decide to move forward with the current concept, or scrap it and start once again, from scratch. Working in bi-weekly increments is highly

efficient in this field, and has proven to be “the new norm” in the software/app design industry. To further elaborate on the facet of inclusivity of clients within the design process, Hajbos further makes the point that it is important to, “[understand] users to solve and satisfy their problems and needs.” She further notes that, “This approach that focuses on users guarantees that the system we develop will also be easily adaptable in other, alternative applications should there be a need to develop them.” Knowing what the target consumer group appreciates about your device or software is one thing, but knowing what isn’t working is an even more valuable morsel of information. This method of ideation is unique as it allows for these shortcomings to be identified early on in the design process, and mitigates the possibility for features falling through come the time of launch. The point she makes about programs being “adaptable” is also a key function of not only agile design, but generally smart design. This concept is paramount to UI/UX design, as software constantly requires updates. To design an application that requires lengthy maintenance times and an excessive amount of effort to update is one is a moot endeavor. Designing with the next update in mind is what smart, agile design is all about. It is also apparent that, “The Agile methodology was created in contrast to the Waterfall methodology, as a much more lightweight set of methods in software development” (Toczyska, 2020, p.1). Software development started off as a rigid process, with phases cascading down, one on top of another, with little room to move against the torrent. Agile UI/UX design concepts allow for teams to move ahead, backtrack if needed, skip around a bit, and ultimately arrive at the solution in a more, free manner. A few key concepts Toczyska notes regarding Agile software development include, “Individuals and interactions...Working software...Customer collaboration...[and] Responding to changes.” These tenets comprise the versatility that agile design has to offer. She also

identifies that, “Both Lean UX and Agile development share the same values and principles,” and that, “They all form a repetitive loop, which can be summed up in three words: think, design, and validate.” The basis of what UI/UX design and Agile design are already connected, which is evidence as to why they work so well in tandem with one another.

5.3.4 Evidence in Product Design

Agile principles and practices exist in other realms of design, with the most important realm to this research being product/industrial design. The application of agile design to industrial design focuses on the deviation from the traditional “waterfall” method, which is rigidly structured, into a process that is more adaptable and “people-oriented”. Researchers from the Key Laboratory of Contemporary Design and Integrated Manufacturing Technology at Northwestern Polytechnical University state that “people” refer to customers, and that through the utilization of agile methods, clients will adequately be involved with and supervise the schedule of each iterative stage. This ultimately allows them to change the design direction in a prompt and flexible manner, and as a result of this, control the correlative risks (G. Yang et.al, 2009). This concept or style of agile industrial design is closely aligned to that of the “co-design” concept, where clientele are heavily involved in the execution of the design process. This strategy allows for insights that wouldn’t be typically available to be paid attention to and possibly incorporated into the revision of the products in question. Looking at the subject through a manufacturing lens, there exists strong correlations between successful manufacturing and agile principles. On a logistics level, “...manufacturers are embracing lean and agile manufacturing initiatives to improve inventory management and operational capabilities”

(OptiProERP, 2022, p.1). This allows businesses to, "...respond quickly to changing customer needs and market demands," through various factors including, "...modular and customer-focused product design, information technology, corporate partners, and knowledge culture." These factors align precisely to the basic tenets of agile design, by encouraging the ability to rapidly modify systems and components, building strong relationships with clientele and welcoming input and feedback from all parties involved. It is also crucial to note that agile manufacturing is, "...focused on fulfilling customer demand in minimal time." Kambale similarly makes it known that agile manufacturing also allows firms to control, or regulate their final product because it addresses the needs and worries of the clients as soon as possible, and because of this, enables firms to have a more firm understanding the market and, ultimately use agile to their advantage by creating products that meet the needs of all of their customers (2021). It is apparent that agile industrial design and manufacturing revolves around customer feedback and iterative addendums to the design in question. With the steadfast evolution of 3D printing, agile industrial design and manufacturing has never been more accessible. Harkening back to the software development scene, there exists the necessity for hardware to act as a vessel for said software. An obstacle that has plagued designers for decades is that of the PCB manufacturing process. Apparently, "The traditional PCB manufacturing process places several constraints on designers, both in terms of design choices and the overall development process" (Cohen, 2019, p.1). With the introduction of additive manufacturing in that of 3D printing, "...an agile electronics development team can move beyond these constraints," by allowing, "...design teams to implement more innovative features and move through more design, build, and test iterations." Product designers and other fields of business are rapidly adopting agile into

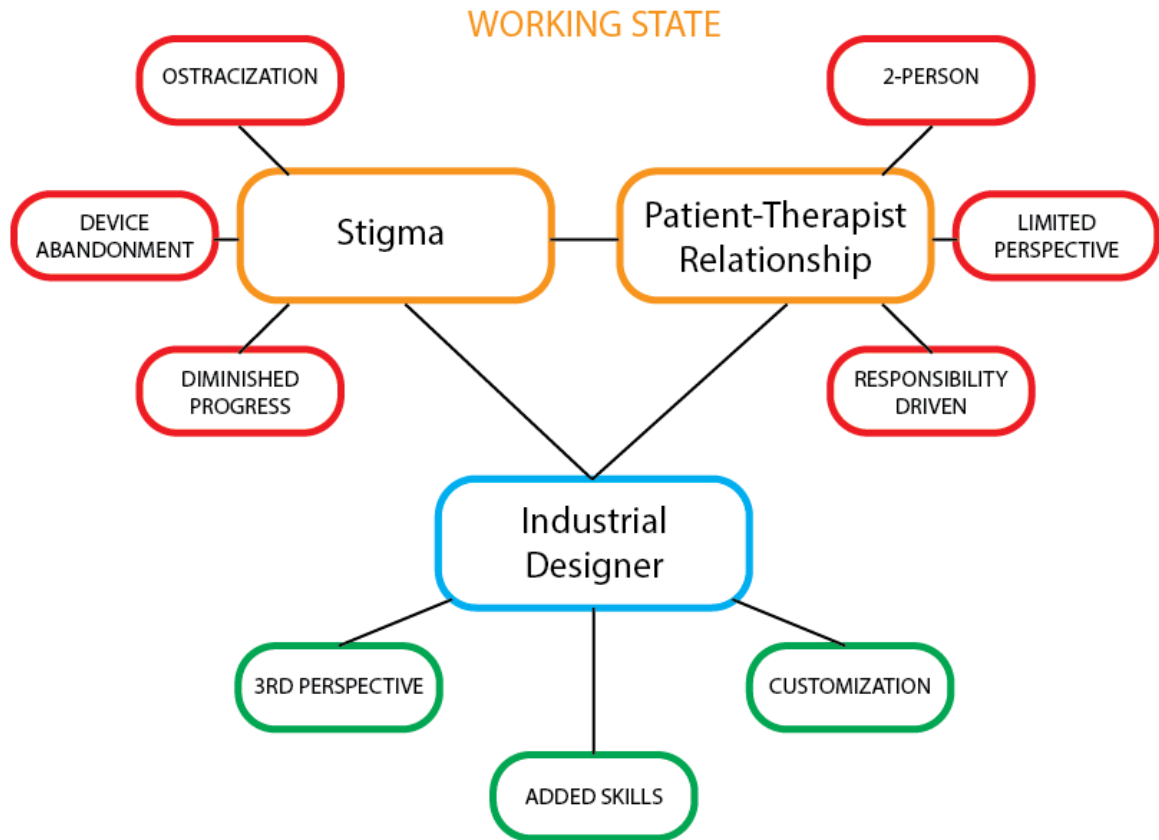
their workflow, and with all the tools available to them in today's day and age, progress and innovation appears to be an inevitability.

5.4.0 The Rehabilitative Triad & Evolved Conceptual Framework

In chapter 2, a conceptual framework was introduced. The current state of this framework is that of how the patient-therapist relationship is reflected in reality. Where it left off, a potential third member was proposed, an industrial designer. After discussing the results of the research phase, through surveys, interviews, and observation, and going into depth on what agile design is and how it may benefit the physical therapy and rehabilitative field, this conceptual framework has ultimately evolved into the following working state.

Figure 10

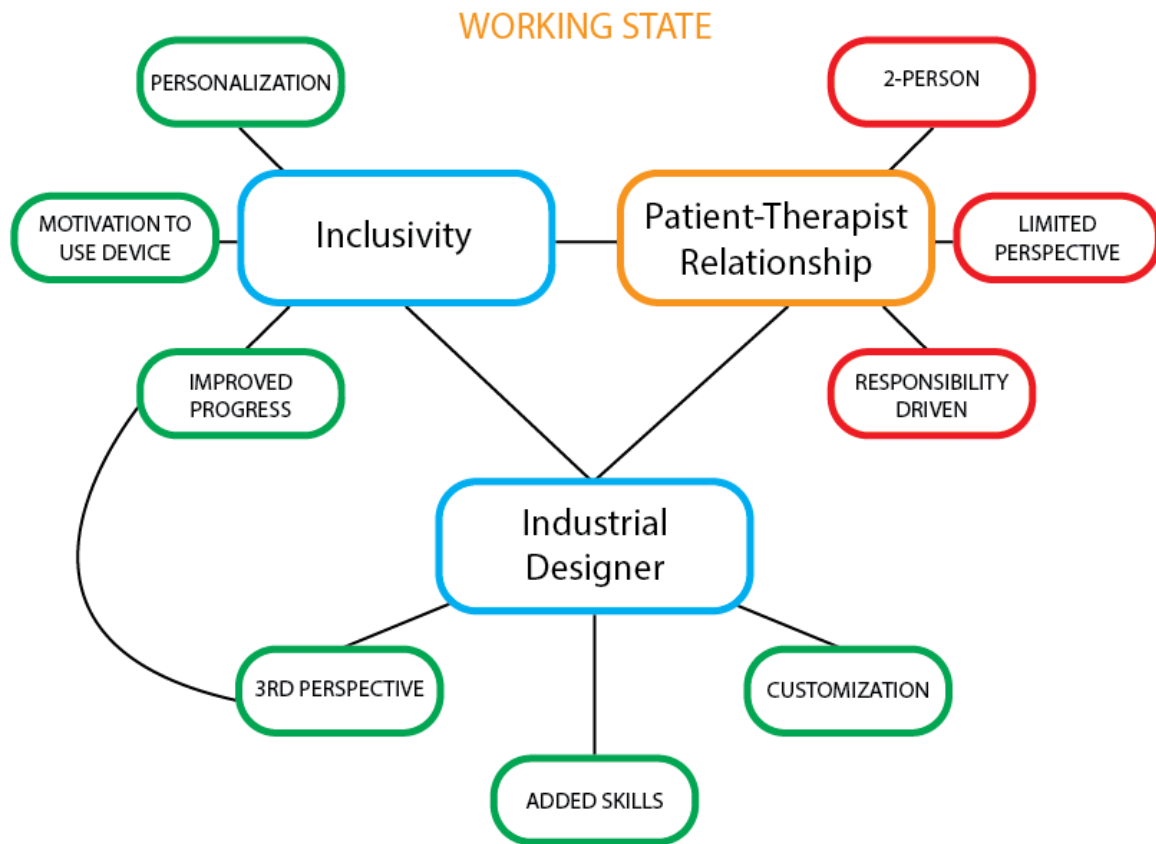
Conceptual Framework ¾



As the figure denotes, the industrial designer has the potential to become a 3rd perspective in this rehabilitative triad, providing agile industrial design services to help design rehabilitative tools used for therapy and personalized assistive and rehabilitative devices utilizing CAD software and additive manufacturing methods. These added skills properly employed possess the possible potential to affect the negative aspects of the existing rehabilitative dyad.

Figure 11

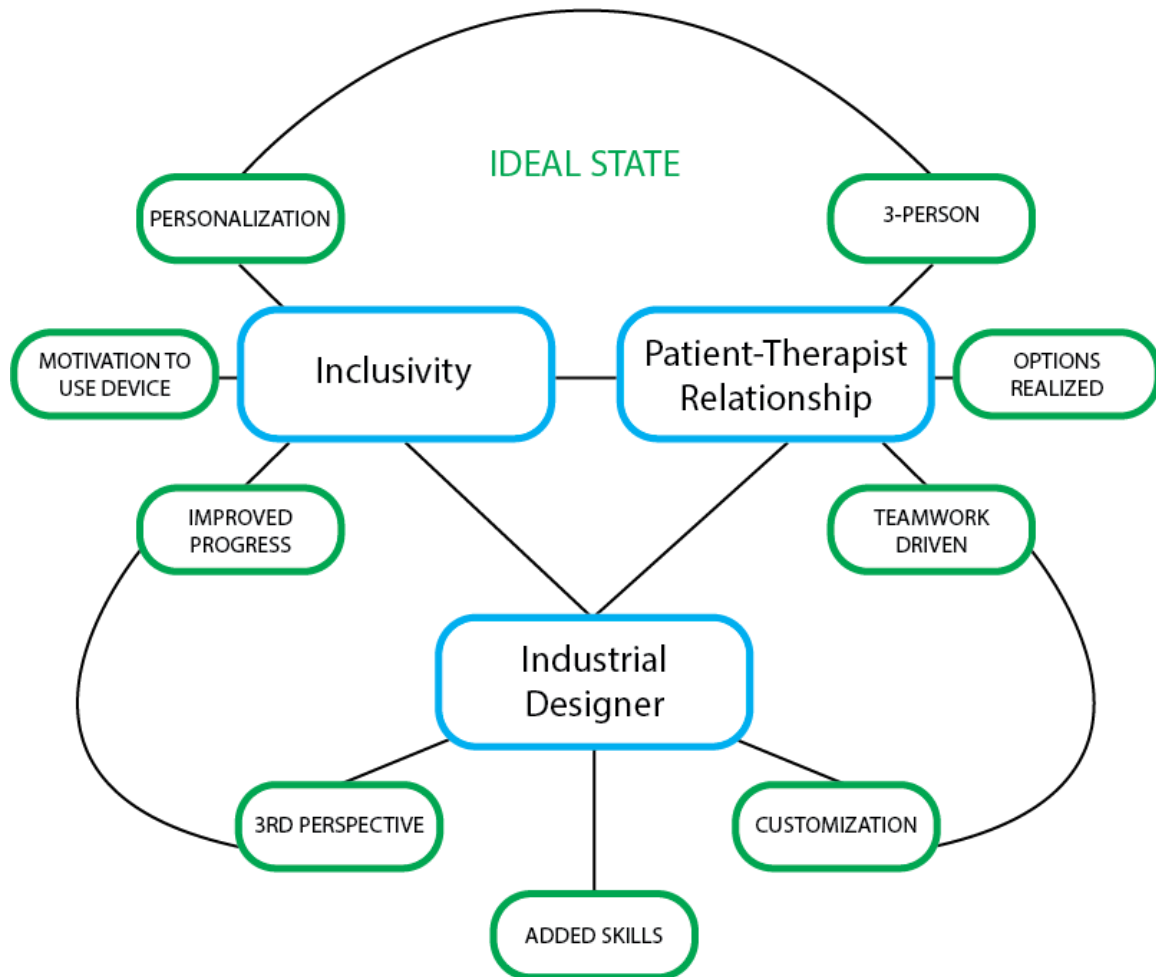
Conceptual Framework %



With the influence of the industrial designer, it is speculated that therapy progress will improve, as a result of increasing motivation to use prescribed devices if they are personalized to meet the client's fitment and aesthetic needs. This will ultimately strive to help shake that concept of stigma by making physical therapy more inclusive to the patient and their achievable desires.

Figure 12

Conceptual Framework 5/5



Finally, the working state matures into a fully ideal state, with the patient-therapist relationship evolving into the Rehabilitative Triad. What was ultimately a responsibility driven relationship with a large amount of stress placed on the physical therapist, the atmosphere is more teamwork driven, with the patient brought into the decision making process as it pertains to the devices they use and how they fit. More viable options are realized as a result of the inclusion of agile design practices, and all parties are encouraged as a result.

5.5.0 Future Research

As previously mentioned in the data analysis section, limited responses were received between three mediums. For firmer conclusions to be made, a substantial amount of continual research must be conducted. In this section, how said research may be conducted, and what exactly will need to be studied will be discussed.

Firstly, in regards to future research, more participants would be highly beneficial. There was only time to visit one clinic, once a week. This yielded a small sample size to pull data from, which may very well have limited the results. At the outset of the research phase, a clinic near the University of Oregon was likely a candidate to conduct research, but limited time and travel funds made that option null. This option will need to be revisited, as taking data from one clinic in Phoenix, AZ is not a diverse enough sample population. Other facilities throughout the states will also need to be reached out to to inquire about possible observation and interviews. Now, if research must be continued in Arizona, there are a few options that may be considered to gain some very detailed insight from experts in the field. One of those experts is Professor Donald Herring at Arizona State University, now retired. Mr. Herring was a long running instructor of a Human Factors course at the university, and has done a considerable amount of work with SWAN Rehabilitation, even having a class in which designers would work with the clinic to create tools that therapists could use when conducting physical therapy. Mr. Herring himself has also done work with medical design, with the air muscle device as an example. Being able to interview Donald Herring would be essential to uncovering more insight from an industrial designer point of view in this field. Another distinguished individual who will surely provide sight in areas that haven't even been considered yet is Patricia Moore, founder of MooreDesign Associates and a renown ethnographic

researcher. Pattie has been a pioneer in the field of universal design, and exploring this field more in-depth may bring about considerations of physical therapy and rehabilitation design that may completely alter the nature of this research. Ms. Moore has even done work in her own rehabilitation centers as an industrial designer, so her insight is paramount to this field of study.

Ethnographic research appears to be a must in this type of study. While the researcher was present during physical therapy sessions, it was still a secondary experience, so to speak. If simulative physical therapy sessions were carried out by the researcher themselves, a clearer understanding of the communication aspect of physical therapy and rehabilitation could have been achieved. Patricia Moore would be a great resource to gain advice on how to properly conduct Ethnographic research for this phase.

Looking back on the response from one of the interviewed therapists, the need for an interdisciplinary clinic will be researched further. What type of disciplines that would be needed, how other disciplines may compliment certain discipline's performance, whether these disciplines operate in-house or out-of-house are just a few areas that may be beneficial to look at.

Lastly, the inclusion of an applied project in the future research phase is without a doubt a necessity. To actually sit down with a patient and therapist and work out a way to make their assistive or rehabilitative device more suitable to their physical and aesthetic needs is what this study is all about. The resources to do so are widely available, so it is a bit strange as to why this wasn't completed in the first place.

The current results from the research phase can provide a decent amount of insight into the physical therapy and rehabilitation field, more specifically into how

patients and therapists react, though a stronger conclusion can still be deduced if a more robust research phase can be carried out.

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APPENDIX A
TABLES

Patients' Perceptions on Stigmas Associated to Assistive/Rehabilitative Devices					
Patient #	Demographic	Device?	Stigma/Self	Stigma/Others	Details
1	Elder Female	Walker	Yes	Yes	Perceives self as "less than", feels others may feel the same way.
2	Elder Female	None	None	None	None
3	Young Adult Male	Sling	Yes	Yes	Self-acceptance is difficult, believes others see them as "handicapped".
4	Young Adult Male	Wheelchair	None	None	Feels very optimistic about their situation.
5	Young Male	None	None	None	Feels very optimistic about their situation.

Young = 18 or Younger Young Adult = 19-39 Elder = 40+

Table A1: *Patients' Perceptions on Stigmas Associated to Assistive/Rehabilitative Devices*

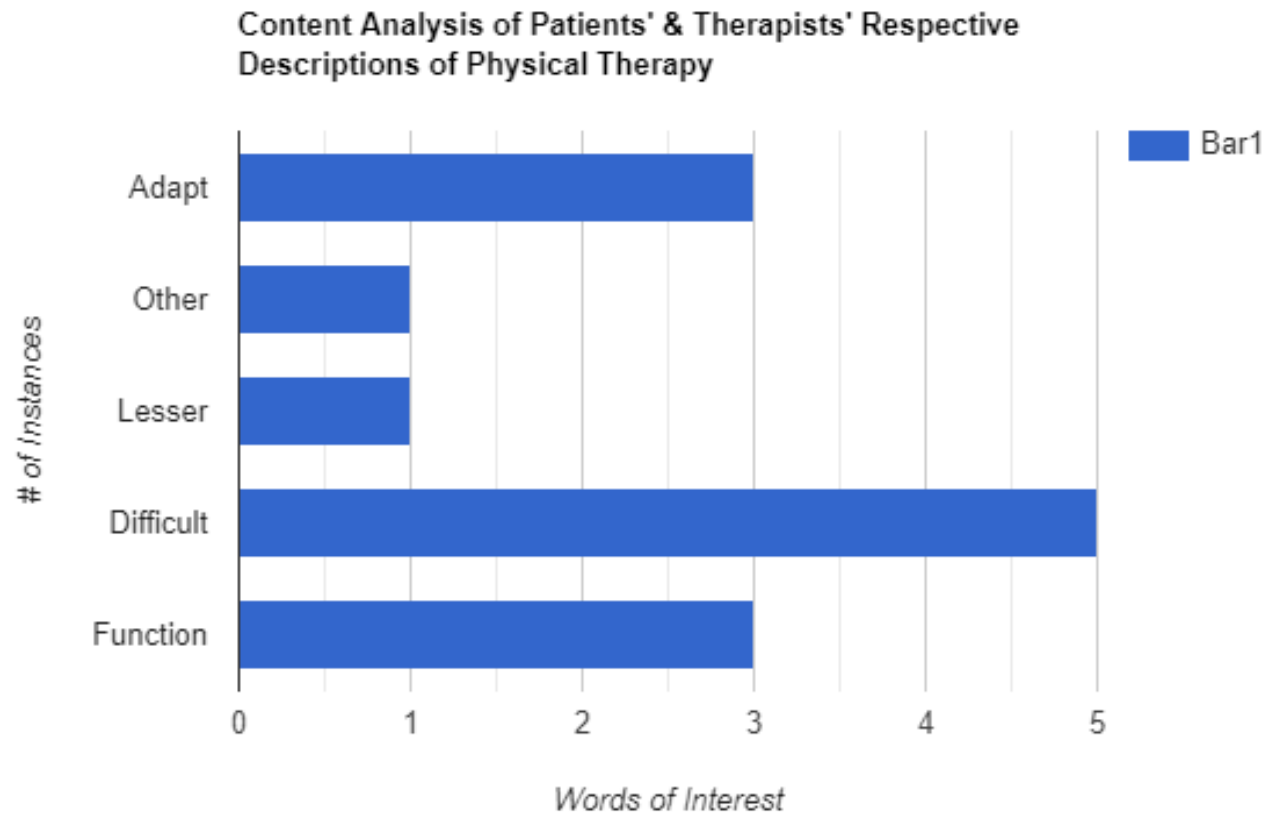


Table A2: Content Analysis of Patients' & Therapists' Respective Descriptions of Physical Therapy

Opinions Regarding Assistive/Rehabilitative Devices on the Market			
Therapist #	Pros	Cons	Details
1	Yes	Yes	Ambulatory devices have come a long way. Hand/Arm deices lacking; too bulky.
2	Yes	Yes	Technology is great; wheelchairs are advancing. Getting quality tech to patients is hard; insurance barriers.
3	Yes	Yes	Some are helpful, others are bulky, expensive, and difficult to set-up.
4	Yes	No	Many options and easily available (Amazon).

Table A3: *Opinions Regarding Assistive/Rehabilitative Devices on the Market*

	Rehab Assistive, or Both?	+	-	Assistive Device	Rehab Device	Assistive Device Comments	Rehab Device Comments
Survey 1	Both			Night Guard	Crutches	Tailor fitted, hard to clean in small spaces	Durable
Survey 2	Both			Walker	Ankle Brace	Takes up a Lot of space	Not physically appealing, easy to clean
Survey 3	Rehab				Tongue Depressor		Wood material, students don't like taste, form is not optimal
Survey 4	Both			Protective Lenses	Flexbar	Difficult to stay motivated to use when younger, made it harder to see sometimes	Great fitment, Durable, confusing at first
Survey 5	Rehab				Wrist/Hand Brace		Fit well and comfortable Smelled bad and hard to clean
Survey 6	Both			Wrist support	Walking boot, Bicep wrap	Fits great, durable	Great fit, durable, easy to clean
Survey 7	Rehab				Wrist brace		Durable, but uncomfortable
Survey 8	Rehab				Fracture Boot		Snug fit, very durable and easy to wash, could be too tight sometimes, bulky
Survey 9	Rehab				Crutches		Uncomfortable and chose to limp, durable and easy to clean

Table A4: Personal Experiences with Assistive/Rehabilitative Technology

APPENDIX B
FIGURES

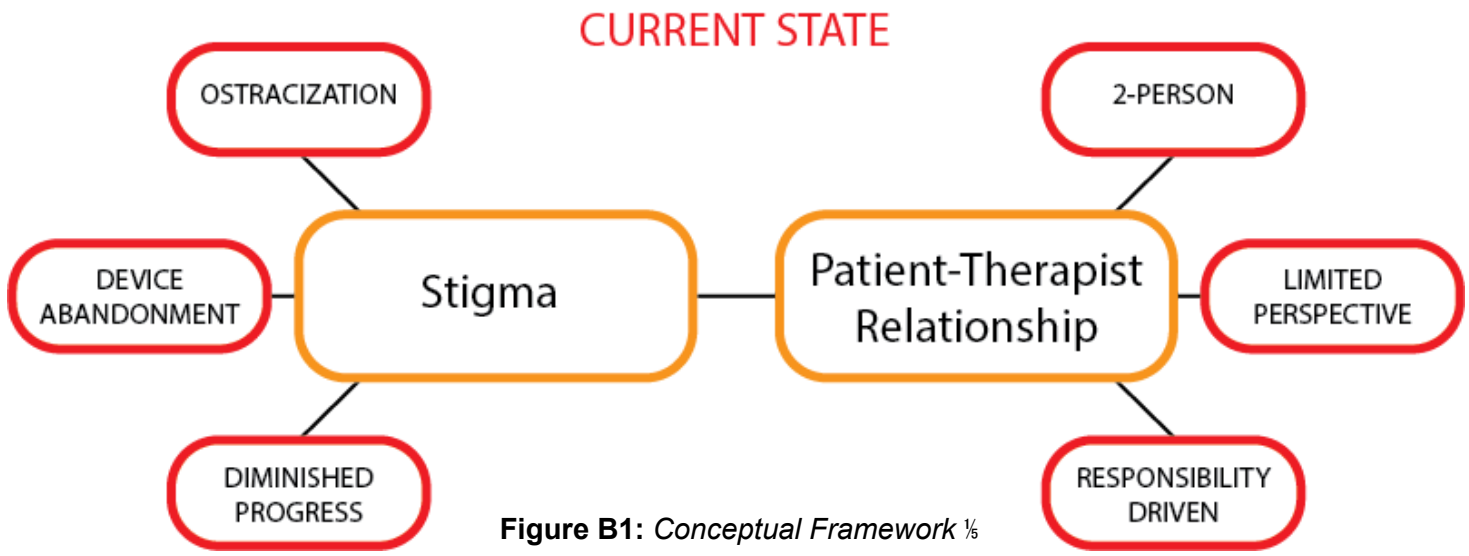
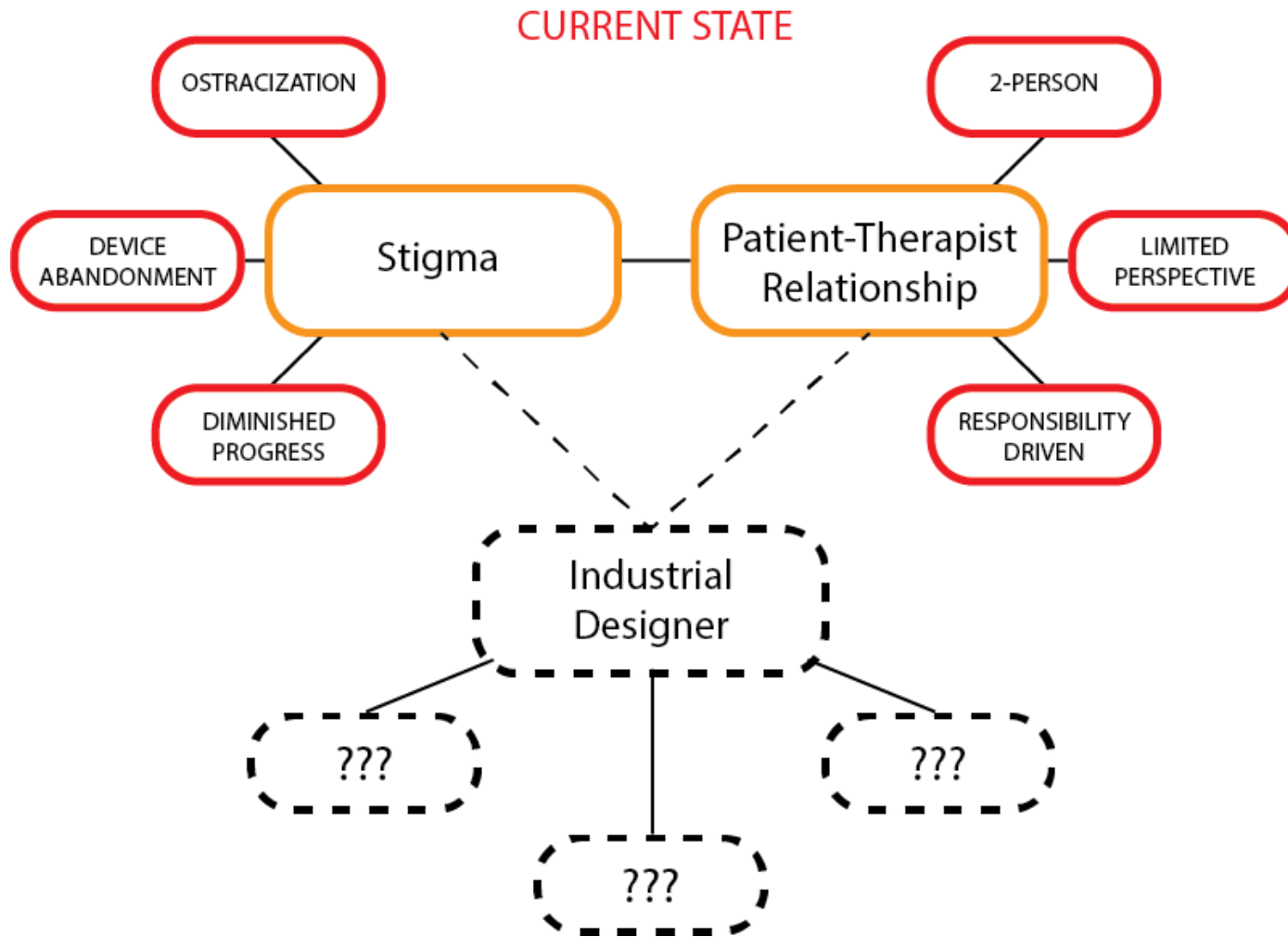


Figure B1: Conceptual Framework 1/6



78

Figure B2: *The Rehabilitative Dyad*



79

Figure B3: Conceptual Framework %

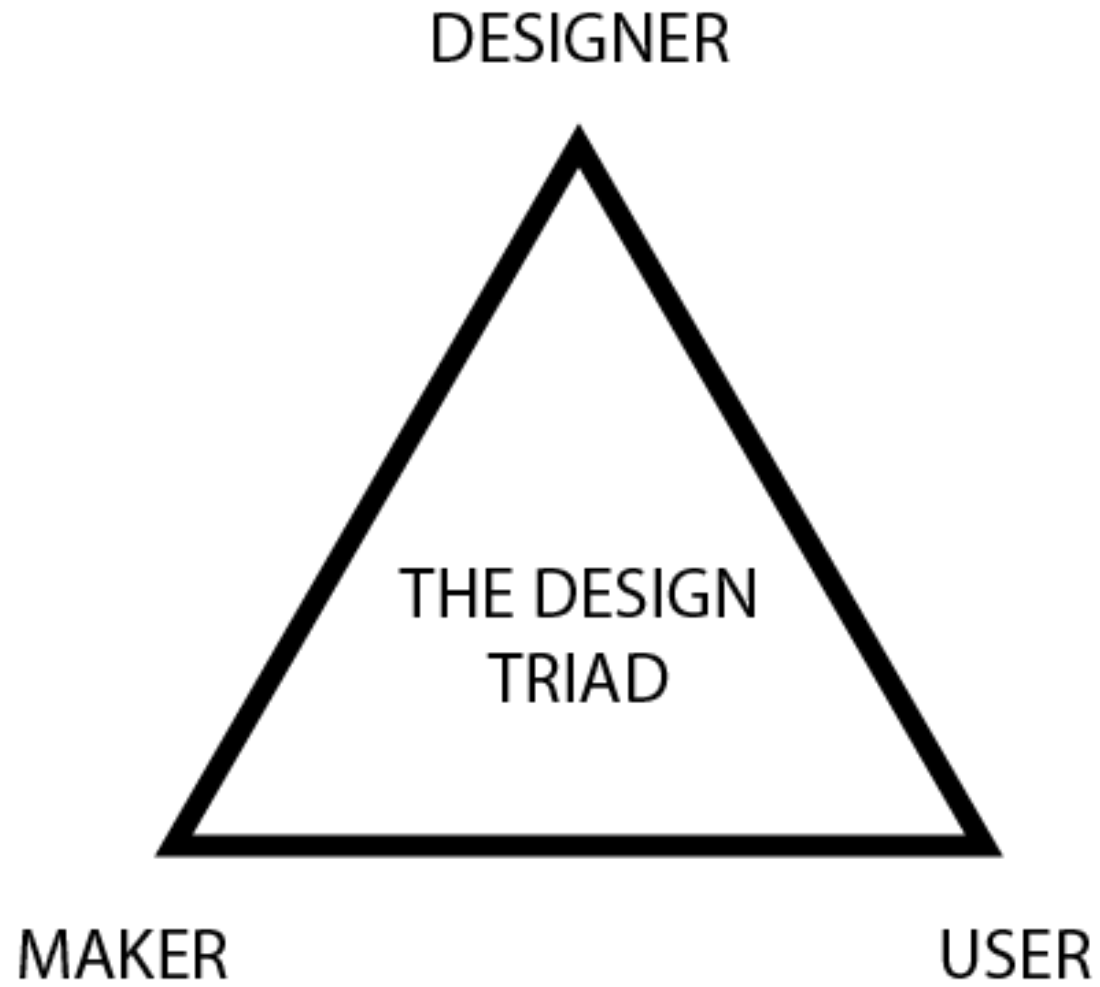


Figure B4: *The Design Triad*

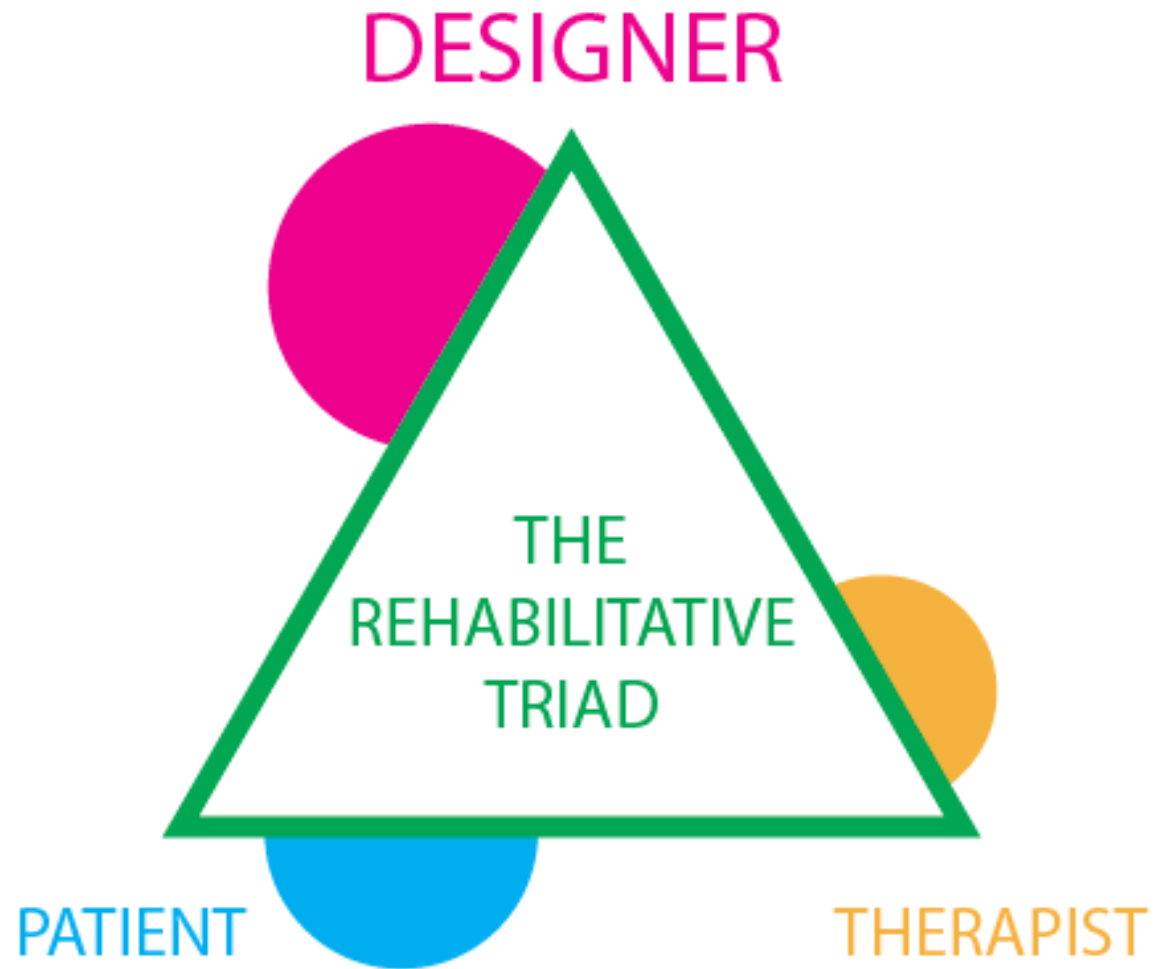


Figure B5: *The Rehabilitative Triad*

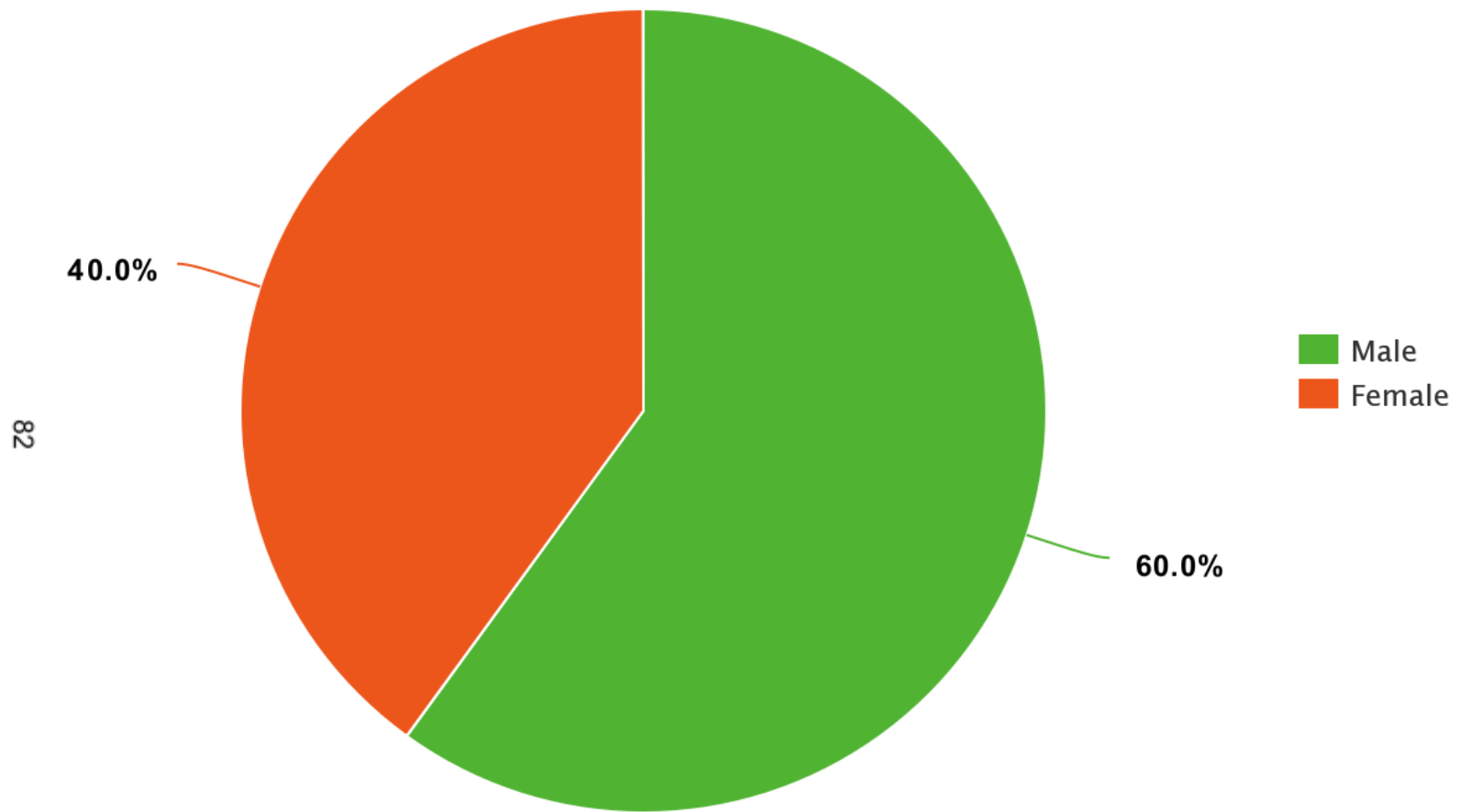


Figure B6: *Gender of Physical Therapy Patients*

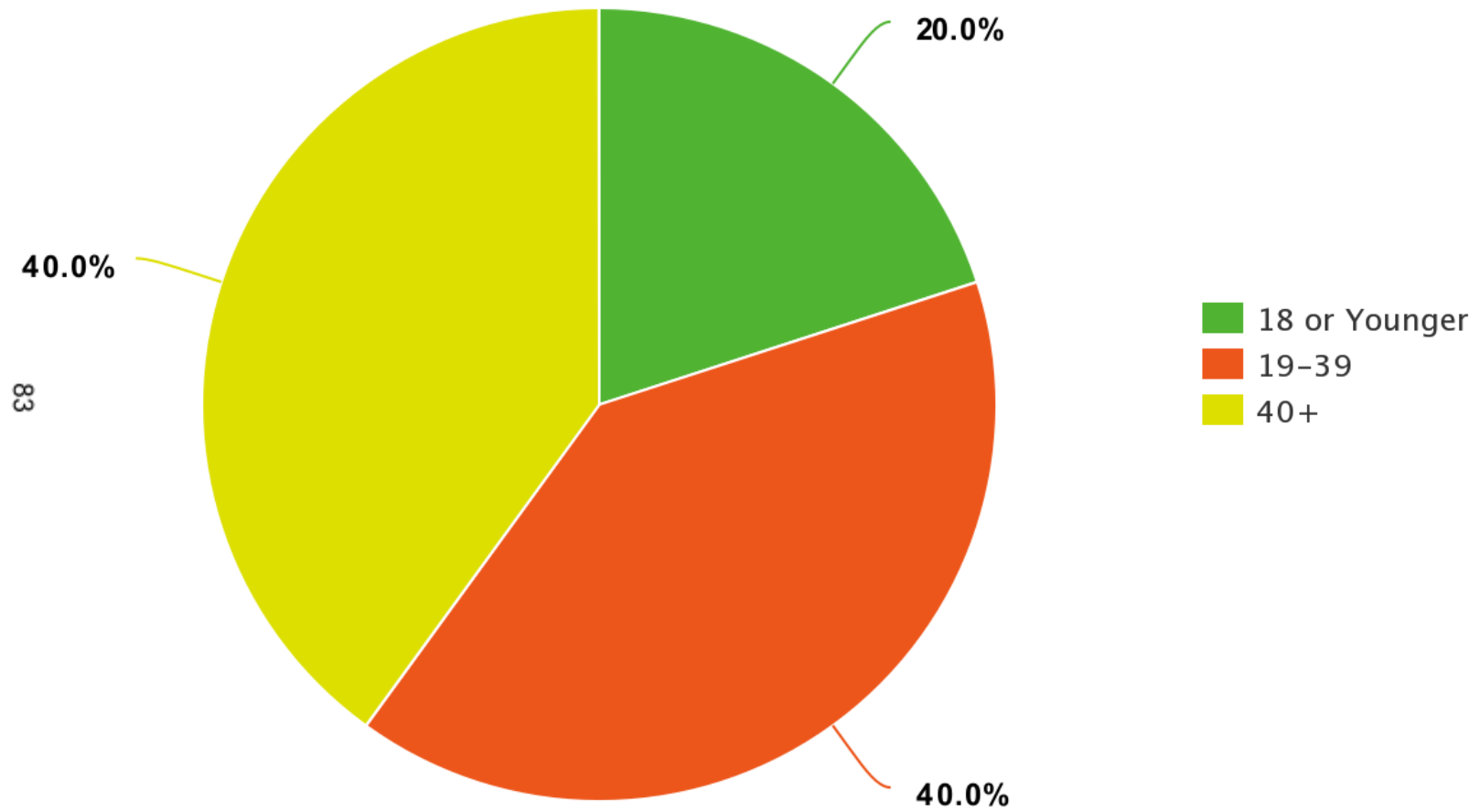


Figure B7: Age of Physical Therapy Patients

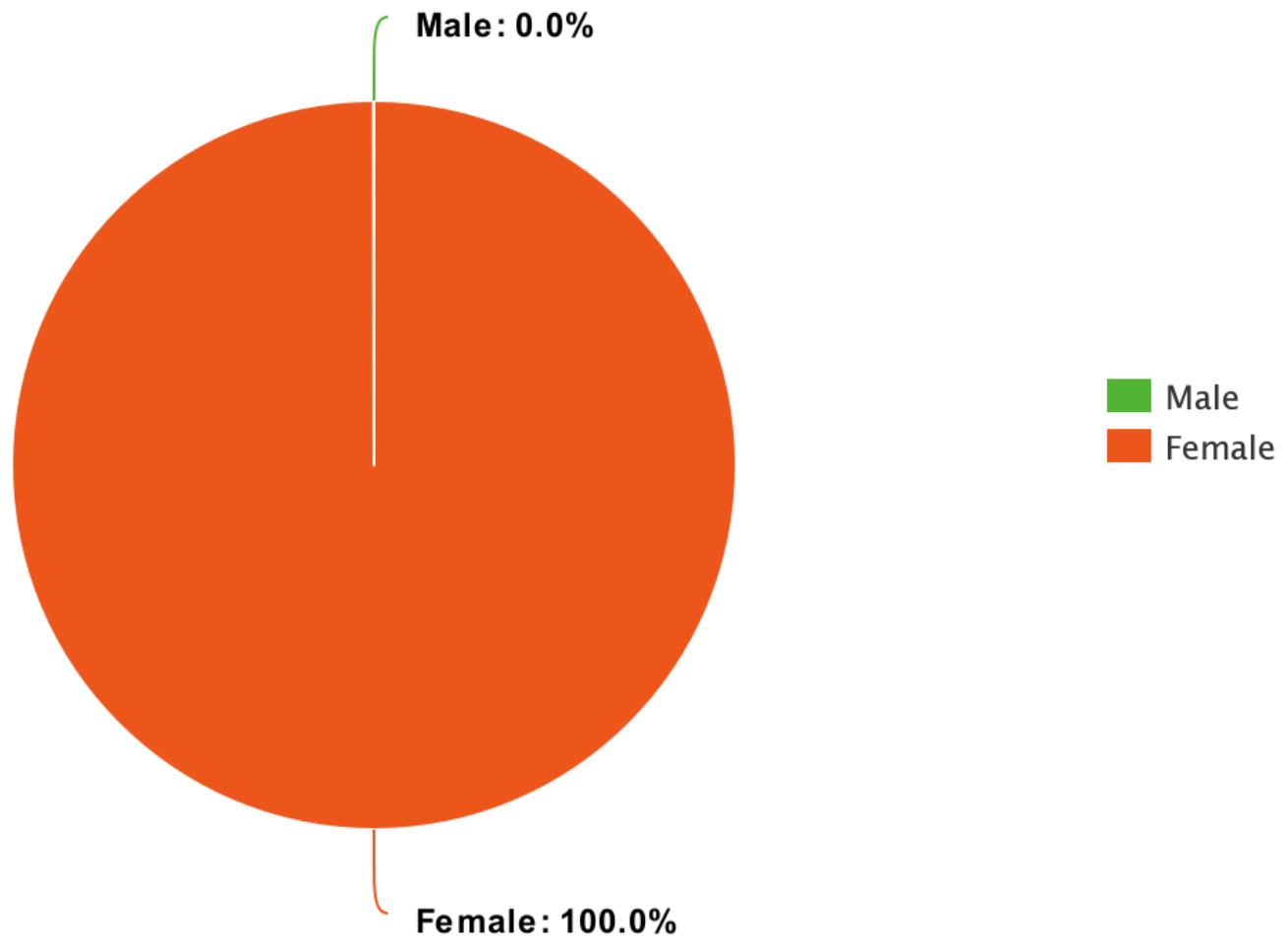


Figure B8: *Gender of Physical Therapists*

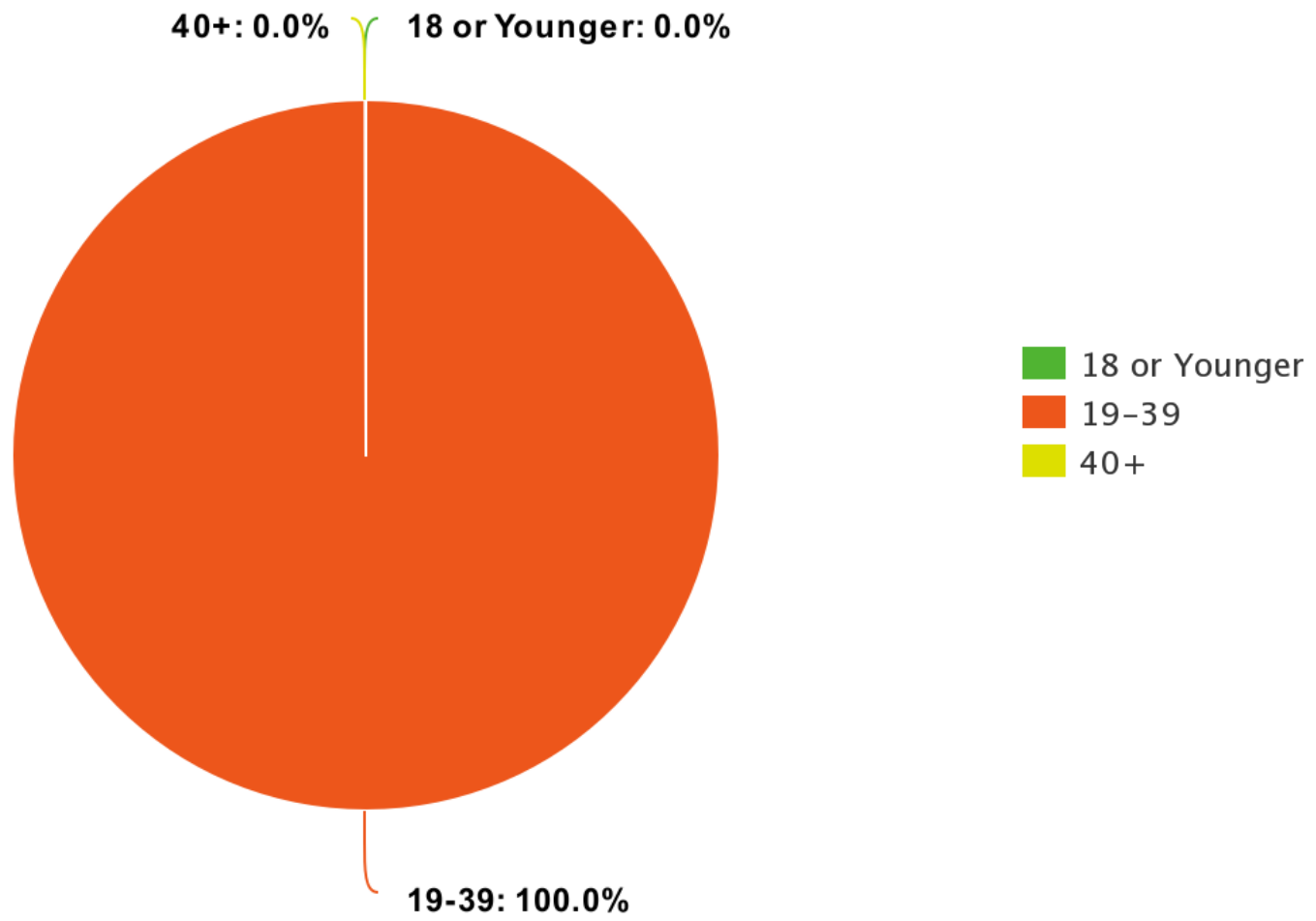


Figure B9: *Age of Physical Therapists*

APPENDIX C
IMAGES



Image C1: *Therapist and Patient Using Exercise Bike*



Image C2: *Patients and Therapist Playing Rehabilitative Game*



Image C3: Patient Undergoing Physical Therapy for Arm Function

APPENDIX D
FORMS



EXEMPTION GRANTED

John Takamura
 HIDA: The Design School
 480/965-7171
 John.Takamura@asu.edu

Dear [John Takamura](#):

On 1/16/2023 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Introducing Agile Industrial Design Concepts into the Health and Wellness Field
Investigator:	John Takamura
IRB ID:	STUDY00016819
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Form of Consent 12.5.22.pdf, Category: Consent Form; • IRB Minor Modifications Addressed.pdf, Category: Other; • IRB Social Behavioral 2019 12.9.22, Category: IRB Protocol; • NDA3765_Takamura_SWAN_Fully_Executed_011223.pdf, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc); • NDA3765_Takamura_SWAN_SCA_FE_011223.pdf, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc); • Patients' Physical Rehabilitation Experiences.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Permission to Conduct Research at SWAN.pdf, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc); • User Perceptions Regarding Rehabilitative & Assistive Devices.pdf, Category: Measures (Survey

Form D1: IRB Approval Pg.1

	questions/Interview questions /interview guides/focus group questions);
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The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2)(ii) Tests, surveys, interviews, or observation (low risk) on 12/8/2022.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

If any changes are made to the study, the IRB must be notified at research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.

Sincerely,

IRB Administrator

cc: Solomon Conway-Janes
Solomon Conway-Janes
Kristin Hoffner
Dosun Shin

Form D2: IRB Approval Pg.2



SWAN Rehab
A Rehab Without Walls®Clinic

1190 E Missouri Avenue, Suite 100
Phoenix, AZ 85014
O 602.393.0520
F 602.393.0523

RehabWithoutWalls.com/SWANRehab

Dress code - business casual

- Dress Pants, no denim, no tights, no yoga pants
- Modest, appropriate shirt for women, collared shirt for men, no denim shirts/jackets
- Closed toed shoes, tennis shoes are acceptable
- Hair must be well groomed
- No facial piercings; no more than 2 earrings per ear for women, no earrings for men, gauges not larger than 4 and must be removed
- **No visible tattoos, all tattoos must be covered**

You will be asked to leave if you are not dressed appropriately

Contacting us

- E-mail is preferred form of contact
- If you are unable to make your planned observation day/time contact us as soon as possible to reschedule

Parking

- Due to limited parking please park at 1110 E. Missouri building, do not park in covered parking spots
- You will walk East to our building at 1190 E Missouri, Ste 100

Recording observation hours

- We provide a form for you to record your observation hours however, **You are responsible to record your hours**
- You may have the recording form when you complete your observation and leave a copy with us
- Inform us if you require verification of hours to PTCAS, OTCAS; if you will require verification of hours please be sure you have left a copy of your recording form upon your last day completed.
- If you need hours verified, you are responsible to obtain the contact information from the therapist(s) accordingly.

Acceptable observation behavior

- Upon arrival you will read and sign a confidentiality agreement to proceed with observation
- BE PROFESSIONAL, BE COURTEOUS, BE HELPFUL
- You will be identified to each patient as an observer and the therapist will get the patient's consent for you to observe their treatment
- Limit conversation with the patient and questions to the therapist until after the treatment unless directed otherwise by therapist
- Please sit professionally in chairs
- **Cell phone must remain off and are not allowed in the gym area**

We also ask that in between sessions if you could please:

- Put Pillowcases on pillows
- Tidy gym between every session, help your therapist and team
- Wipe down mats in gym after every patient

Form D3: SWAN Research Procedures



SWAN Rehab

A Rehab Without Walls® Clinic

NON-DISCLOSURE AGREEMENT

This Non-disclosure Agreement (this "**Agreement**") is made effective as of 12,5,22 (the "**Effective Date**"), by and between SWAN Rehab and (the "**Recipient**"), **Arizona Board of Regents for and on behalf of Arizona State University, and its employees, Dr. John Takamura and Solomon James**. SWAN Rehab has requested and the Recipient agrees that the Recipient will protect the confidential material and information which may be disclosed between SWAN Rehab and the Recipient. Therefore, the parties agree as follows:

I. CONFIDENTIAL INFORMATION. The term "Confidential Information" means any information or material which is proprietary to SWAN Rehab, whether or not owned or developed by SWAN Rehab, which is not generally known other than by SWAN Rehab, and which the Recipient may obtain through any direct or indirect contact with SWAN Rehab. Confidential Information shall include any information provided by SWAN Rehab concerning the business, technology and information of SWAN Rehab and any third party with which SWAN Rehab deals, including, without limitation, business records and plans, technical data, product ideas, contracts, financial information, pricing structure, discounts, computer programs and listings, source code and/or object code, copyrights and intellectual property, inventions, sales leads, strategic alliances, partners, and customer and client lists. This agreement governs Confidential Information disclosed by SWAN Rehab for one (1) year from the Effective Date. To be protected hereunder, information must be marked confidential if disclosed in written or other tangible form. If information is disclosed orally or visually, information must be identified as confidential at the time of disclosure and reduced to writing, marked confidential, and transmitted to the receiving party within thirty (30) days of the initial disclosure.

A. "Confidential Information" does not include:

- matters of public knowledge that result from disclosure by SWAN Rehab;
- information rightfully received by the Recipient from a third party without a duty of confidentiality;
- information independently developed by the Recipient;
- information disclosed by operation of law;
- information disclosed by the Recipient with the prior written consent of SWAN Rehab; and any other information that both parties agree in writing is not confidential.

B. Notice is hereby provided that ASU is a public institution under the State of Arizona, and as such, is subject to A.R.S. §§ 39-121 through 39-127 regarding public records. Any provision regarding confidentiality is limited to the extent necessary to comply with Arizona law.

Form D4: SWAN Non-Disclosure Agreement Pg. 1

II. PROTECTION OF CONFIDENTIAL INFORMATION. The Recipient understands and acknowledges that the Confidential Information about SWAN Rehab patients or techniques and other information has been developed or obtained by SWAN Rehab by the investment of significant time, effort and expense, and that the Confidential Information is a valuable, special and unique asset of SWAN Rehab which provides SWAN Rehab with a significant competitive advantage, and needs to be protected from improper disclosure. In consideration for the receipt by the Recipient of the Confidential Information, the Recipient agrees as follows:

A. No Disclosure. The Recipient will hold the Confidential Information in confidence and will not disclose the Confidential Information to any person or entity without the prior written consent of SWAN Rehab.

B. No Copying/Modifying. The Recipient will not copy or modify any Confidential Information without the prior written consent of SWAN Rehab.

C. Unauthorized Use. The Recipient shall promptly advise SWAN Rehab if the Recipient becomes aware of any possible unauthorized disclosure or use of the Confidential Information.

D. Application to Employees. The Recipient shall not disclose any Confidential Information to any employees of the Recipient, except those employees who are required to have the Confidential Information in order to perform their job duties in connection with the limited purposes of this Agreement. Each permitted employee to whom Confidential Information is disclosed shall sign a non-disclosure agreement substantially the same as this Agreement at the request of SWAN Rehab.

E. Recipient's Obligation. The Recipient's obligations regarding Confidential Information received pursuant to this Agreement survive for three (3) years from the Effective Date.

III. UNAUTHORIZED DISCLOSURE OF INFORMATION - INJUNCTION. If it appears that the Recipient has disclosed (or has threatened to disclose) Confidential Information in violation of this Agreement, SWAN Rehab shall be entitled to seek an injunction to restrain the Recipient from disclosing the Confidential Information in whole or in part. SWAN Rehab shall not be prohibited by this provision from pursuing other remedies, including a claim for losses and damages.

SWAN Rehab acknowledges and agrees that: (1) federal agencies that provide funding for research may require disclosure of contracts pursuant to Section 223 of the National Defense Authorization Act (NDAA), Section 117 of the Higher Education Act of 1965, as amended (HEA), and National Security Presidential Memorandum 33 (NSPM-33) (collectively, "Federal Disclosure Requirements"); and (2) nothing in this Agreement shall prevent the Recipient from disclosing the Agreement to federal agencies pursuant to the Federal Disclosure Requirements.

*** Signature page to follow ***

Form D5: SWAN Non-Disclosure Agreement Pg. 2

SWAN Rehab

Arizona Board of Regents for and on behalf of
Arizona State University

Elizabeth J. Moore PT, DPT, GCS
Printed Name: Elizabeth Moore PT, DPT, GCS
Title: Rehabilitation Director
Date: 1/12/2023

Kristy Macdonald
Printed Name: Kristy Macdonald
Title: Assistant Director, Research Operations
Date: 1/12/2023

Read, Acknowledged, and Agree to comply with the terms and conditions of this agreement



PI Printed Name: Dr. John Takamura
Title: Professor
Date: 1/11/23



Student Printed Name: Solomon Janes
Date: 1.11.23

Form D6: SWAN Non-Disclosure Agreement Pg. 3



SWAN Rehab
A Rehab Without Walls® Clinic

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Phoenix, AZ 85014
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F 602.393.0523
RehabWithoutWalls.com/SWANRehab

Student Confidentiality Agreement

It is important to recognize that protected health information (PHI) includes medical records relating to a patient's past, present and future care and treatment as well as billing records related to that care which contains any of the following identifiers:

- Names
- Medical Records
- Geographic subdivisions smaller than a state
- Telephone/fax numbers
- E-mail addresses
- Social Security Numbers
- Medical record numbers
- Health plan beneficiary numbers
- Account numbers
- All elements of dates related to individual
- Certificate/license numbers
- Vehicle identifiers/serial numbers
- Device identifiers/serial numbers
- URL's
- Internet protocol address number
- Biometric identifiers (finger/voice prints)
- Full face photo image
- Any other unique identifying number, characteristic, or code

I understand that SWAN Rehabilitation, (referred to as Facility) has a legal and ethical responsibility to maintain patient privacy, including obligations to protect the confidentiality of patient protected health information ("PHI") and to safeguard the privacy of patient and facility information. In addition, I understand that during my affiliation as a student/faculty with the Facility, I may see or hear other Confidential Information such as financial data and operational information that the Facility is obligated to maintain as confidential.

The term of this Confidentiality Agreement starts from this date and is continued after the rotation has ended.

As a condition of my affiliation as a student and/or precepting faculty member with the Facility I understand that I must sign and comply with this Agreement.

I will use and disclose PHI and/or Confidential Information only if such use or disclosure complies with the Facility Policies and Procedures and is required for the performance of my responsibilities as a student or precepting faculty in the care and treatment of patients. The use and disclosure of PHI and/or Confidential Information for the purpose

Form D7: SWAN Student Confidentiality Agreement Pg. 1

of care and treatment of patients does not include the use or disclosure of PHI and/or Confidential Information for educational endeavors such as writing educational reports for my course of study, engaging in seminars and presentations in the educational setting.

My personal access code(s), user ID(s), access key(s) and password(s) used to access Facility computer systems or other equipment are to be kept confidential at all times. Since the use of PHI and Confidential Information includes access, I will not access or view any PHI or Confidential Information other than what is required to perform my responsibilities as a student and/or precepting faculty in the care and treatment of patients. If I have any questions, I will immediately ask my precepting faculty or the Privacy Officer of the Facility for clarification.

I will not discuss any information pertaining to patient PHI or the Facility in an area where unauthorized individuals may hear such information (for example, in hallways, on elevators, in the cafeteria, on public transportation, at restaurants, and at social events). I understand that it is not acceptable to discuss any PHI or Confidential Information in public areas even if specifics such as patient's name are not used.

I will not make inquiries about any PHI for any individual or party for whom I am not authorized to have such information as a part of my involvement in patient care and treatment. In addition, I will not ask other persons to obtain PHI or Confidential Information knowing that that person does not have the authority to access such information on my behalf.

I will not make any unauthorized transmissions, copies, disclosures, inquiries, or modifications of PHI or Confidential Information. Such unauthorized transmissions include, but are not limited to, removing and/or transferring PHI or Confidential Information from the Facility's computer systems to unauthorized locations (for instance, my home or school computer).

Upon termination of my affiliation with the Facility, I will immediately return all property (e.g. keys, documents, ID badges, etc.) to my precepting faculty and the Facility. **I understand that it is my obligation to return all patient PHI to my precepting faculty and the Facility upon completion of my clinical rotation at the Facility. Faculty are responsible for the destruction of PHI, whether hard copy or electronic.**

I agree that my obligations under this Agreement regarding PHI and Confidential Information will continue after the termination of my affiliation with the Facility.

I understand that violation of this Agreement may result in disciplinary action, up to and including termination of my affiliation with the Facility and/or suspension, restriction or loss of privileges in accordance with the Facility's Policies and Procedures, as well as potential personal civil and criminal legal penalties.

I understand that any PHI or Confidential Information that I access or view at the Facility does not belong to me.

I am aware that the Facility reserves and intends to exercise the right to review, audit, intercept, access, and act upon inappropriate use of the Facility's computer systems at any time, with or without user notice and that such access by the Facility may occur during or after working hours. The intent of this Agreement is to ensure that students and

Form D8: SWAN Student Confidentiality Agreement Pg. 2

their faculty preceptors comply with HIPAA Regulations and the Facility Privacy Policies and Procedures.

I have read the above Agreement and agree to comply with all its terms as a condition of my continued affiliation with the Facility.

Student Signature

12.1.22
Date

SOLAMON JAMES
Print Your Name

THE DESIGN SCHOOL @ ASU TEMPE
School

Arizona Board of Regents for and on behalf of Arizona State University

Kristy Macdonald
Printed Name: Kristy Macdonald
Title: Assistant Director, Research Operations -
Date: 1/12/2023

[Signature]
PI Printed Name: Dr. John Takamura
Title: Professor
Date: 1/11/23

Form D9: SWAN Student Confidentiality Agreement Pg. 3



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To whom it may concern,

I, Elizabeth Moore the Rehabilitation Director, allow SWAN Rehab a Rehab Without Walls Clinic at 1190 E. Missouri Avenue in Phoenix Arizona to be a site of research conducted by Solomon Janes with affiliation of Arizona State University-Industrial Design School.

Thank you,

Elizabeth J. Moore P.T., DPT
Board-Certified Clinical Specialist in Geriatric Physical Therapy
Outpatient Rehabilitation Director
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Form D10: SWAN Research Approval Email

Form of Consent

I am a graduate student under the direction of Professor John Takamura, Ph.D in the Herberger Institute of Design and the Arts at Arizona State University. I am conducting a research study to obtain a deeper understanding of physical rehabilitation, assistive and rehabilitative devices, associated stigmas and beliefs attached to the use of said devices, and the existing relationship between patients and therapists.

I am inviting your participation, which will involve an observation period of your daily rehabilitation routine, and follow-up interviews regarding your rehabilitation experience, insights, possible pain points, and opinions on the overall process and related areas. Interviews will take approximately 15-30 minutes, while observation sessions will align with your therapy sessions. The span of this research will last no longer than two months, with one visit on a weekly to bi-weekly basis, depending on availability. You have the right not to answer any question, and to stop participation at any time.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. **You must be 18 years of age or older to participate in this study.**

Your responses in the interview will be analyzed deeply, and the conclusions drawn from your input, feedback, experiences, and anecdotes will be evidence to either support or deny the thesis being researched. This information has the potential to assist in the evolution of what physical therapy, assistive and rehabilitative devices, and patient-therapist interactions may look like in the near future. There are no foreseeable risks or discomforts to your participation.

To ensure confidentiality, your name will not be included in data analyses, transcriptions, or reports, instead, a participant identifier will be associated to you at the beginning of research in an alphanumerical format. Your responses will be anonymous. The results of this study may be used in reports, presentations, or publications but your name will not be used. De-identified data collected as a part of current study will not be shared with others (e.g., investigators or industry partners) for future research purposes or other uses.

I would like to audio record interview. **The interview will not be recorded without your permission.** Please check one of the boxes below to opt-in or decline the recording of our interview; you also can change your mind after the interview starts, just let me know.

I grant permission to be audio recorded. I **DO NOT** grant permission to be audio recorded.

If you have any questions concerning the research study, please contact the research team at: (John.Takamura@asu.edu or sconwayi@asu.edu). If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788. Please let me know if you wish to be part of the study.

By signing below, you are agreeing to be part of the study.

Name: _____

Signature: _____ Date: _____

Form D11: Research Form of Consent

Photo Release Form

I am a graduate student under the direction of Professor John Takamura, Ph.D in the Herberger Institute of Design and the Arts at Arizona State University. I am conducting a research study to obtain a deeper understanding of physical rehabilitation, assistive and rehabilitative devices, associated stigmas and beliefs attached to the use of said devices, and the existing relationship between patients and therapists.

I would like to record the process of therapy through photos. Photos will not be taken without your permission. Your face will be blurred and personal information will not be recorded. Please let me know if you do not want to be photographed.

If you have any questions concerning the research study, please contact the research team at: (John.Takamura@asu.edu or sconwayi@asu.edu). If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788. Please let me know if you wish to be part of the study.

By signing below, you are agreeing to be part of the study.

Name: _____

Signature: _____ Date: _____

Form D12: Photo Release Form

Patient Interview Questions List

(Questions to ask; interview is semi-structured, to avoid falling into a rigid guideline. My goal is to get them to open up about things they usually wouldn't share, in an attempt to get honest, anecdotal evidence.)

When did you first begin treatment?

Can you describe what happened that caused you to seek treatment?

What are some parts of your recurring treatment routine?

Do you use any assistive or rehabilitative devices currently, or have you used any in the past?

Can you tell me some of the pros and cons of the assistive or rehabilitative device you have used?

Are you aware of or face any stigmas associated to your condition, or the device you may use?

How do you think others perceive you as a user of one of these devices?

How do you perceive yourself as a user of one of these devices?

Can you tell me about your relationship with your therapist?

Is there anything you would change about the device you currently use or have used in the past?

Is there anything that you would change about your relationship with your therapist, or is there anything that you wish they knew?

Form D13: Patient Interview Form

Therapist Interview Questions List

(Questions to ask; interview is semi-structured, to avoid falling into a rigid guideline. My goal is to get them to open up about things they usually wouldn't share, in an attempt to get honest, anecdotal evidence.)

How long have you been a physical therapist?

What made you want to pursue this line of work?

Have you ever undergone physical therapy? If so, have you ever used a rehabilitative or assistive device?

(Can ask further questions about the device if they have used one, similarly to patient question)

What does a typical session of therapy entail?

What is it like to work with patients on a day-to-day basis?

What are some pros and cons to working with patients? What are some things you enjoy? What are some hardships you face?

Do you think you are able to effectively communicate with your patients?

Has there ever been a miscommunication between you and your patient?

Has a patient ever made a remark or request that couldn't be fulfilled?

What is your overall opinion on the assistive and rehabilitative devices available on the market today?

Is there anything that you would change about the patient-therapist interaction? Is it fine the way it is?

Form D14: Therapist Interview Form

Therapist Interview Questions List

(Questions to ask; interview is semi-structured, to avoid falling into a rigid guideline. My goal is to get them to open up about things they usually wouldn't share, in an attempt to get honest, anecdotal evidence.)

How long have you been a physical therapist?

-7 Years

What made you want to pursue this line of work?

-Patient first, inspired by knee injury, personally important, technician, helped with other patients, being a friend

Have you ever undergone physical therapy? If so, have you ever used a rehabilitative or assistive device?

(Can ask further questions about the device if they have used one, similarly to patient question)

-crutches and brace (never comfortable, can't get it tight enough)

What does a typical session of therapy entail?

-Never typical, mat work, strengthening, balancing and gaits, mobility, motor skills,, ambulatory

What is it like to work with patients on a day-to-day basis?

-Challenging, high-level patients to lower level, enjoyable, witching mentality between patients, enjoyable

What are some pros and cons to working with patients? What are some things you enjoy? What are some hardships you face?

-Patients don't improve, call to stop therapy, patients terrified of discharge

Do you think you are able to effectively communicate with your patients?

-Yes, aphasia, poor cognition can be difficult

Has there ever been a miscommunication between you and your patient?

-Early years of career, pushy patient butting heads badly, meeting afterwards learned to match power

Has a patient ever made a remark or request that couldn't be fulfilled?

-continue therapy after discharge, want to work again against possibility

What is your overall opinion on the assistive and rehabilitative devices available on the market today?

-Tech is wonderful, wheelchairs are great, getting good tech to patients difficult

Is there anything that you would change about the patient-therapist interaction? Is it fine the way it is?

-Neuro/Ortho combo clinic healthcare education, more interdisciplinary interaction

Form D15: Therapist Interview Form Completed Example

Default Question Block

Q1. What was the duration of your rehabilitative experience?

Q2. What part of the body was the focus of your rehabilitation? (check all that apply)

Arm

Wrist

Neck

Shoulder

Leg

Ankle

Foot

Back

Hip

Other

Q3. Were you an inpatient, outpatient, or mix of both?

Inpatient

Outpatient

Both

Q4. Roughly how many staff were directly involved in your physical therapy regiment?

1

2-3

4-5

6+

Q5. How many facilities did you visit throughout your rehabilitative journey?

1

2

3

4+

Q6. How many rehabilitative/assistive devices (slings, braces, crutches, chairs, etc.) were you required to use?

1

2

3

4+

Q7. Are you still using a rehabilitative/assistive device?

Yes

No

Q9. Please select ONE part of the body that required rehabilitation below.

Arm

Wrist

Neck

Shoulder

Leg

Ankle

Foot

Back

Hip

Other

Q10. After treatment, what is the level of mobility of the body part selected in the previous question?

1 = No Mobility; 100 = Full Mobility

0 10 20 30 40 50 60 70 80 90 100
Mobility

Q11. After treatment, what is the level of pain in the body part selected in question 9?

1 = No Pain; 10 = Unbearable Pain

0 1 2 3 4 5 6 7 8 9 10
Pain

Q12. At this point in time, how satisfied are you with the overall quality of your rehabilitative journey?

Extremely Moderately Slightly Neither
dissatisfied dissatisfied dissatisfied satisfied
nor
dissatisfied satisfied Moderately Extremely
Satisfaction

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Form D18: Patients' Physical Rehabilitation Experiences Pg. 3

Default Question Block

Q1. Please list an assistive or rehabilitative device you have used or are currently using.

Assistive Device: Any device that is designed, made, or adapted to assist a person perform a particular task indefinitely.

Rehabilitative Device: Any device that is designed, made, or adapted to assist a person in restoring previous bodily capabilities and functions.

Q2. User Perceptions Regarding Rehabilitative & Assistive Devices

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
My device is comfortable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device is easy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device is adjustable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device is customizable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device is easy to wash.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device smells good.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device is durable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device has a likable aesthetic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device entices me to want to use it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
There are many different brands that sell my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get excited to use my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use my device every day.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using my device is a chore.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People treat me differently when they see me use my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel independent when I am using my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel like people label me as "other" because I use my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I forget to use my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think about breaking my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device has a bad smell.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People treat me poorly because of my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My life is made easier when I use my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had a say in what device I got to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had a say in my device's design.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like the color of my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device was affordable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People compliment my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device is too big.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Form D20: User Perceptions Regarding Rehabilitative & Assistive Devices Pg. 2

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
It is easy to store my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I could change the color of my device, I would.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My device is improving my condition.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel like my device was designed well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would buy my device again if I needed to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People avoid me because of my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Children ask me about my device.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I could design my own version of my device, I would.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Form D21: User Perceptions Regarding Rehabilitative & Assistive Devices Pg. 3