



Dan Formosa Ph.D.

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Turn design education upside down

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I am invited occasionally to guest-lecture at industrial design schools, about design, research, and usability. Upon visiting every school representative provides a similar description of their program. It goes something like “We’re different from past, traditional industrial design programs. We’re all about understanding people. We take a human-centered approach.”

Me: “Oh, that’s great. Do you require courses in ergonomics or biomechanics?”

Them: “No.”

Me: “How about psychology?”

Them: “No.”

Me (wondering): “Well if you’re not about the physical body, and not about the mind, what part of the human are you about?”

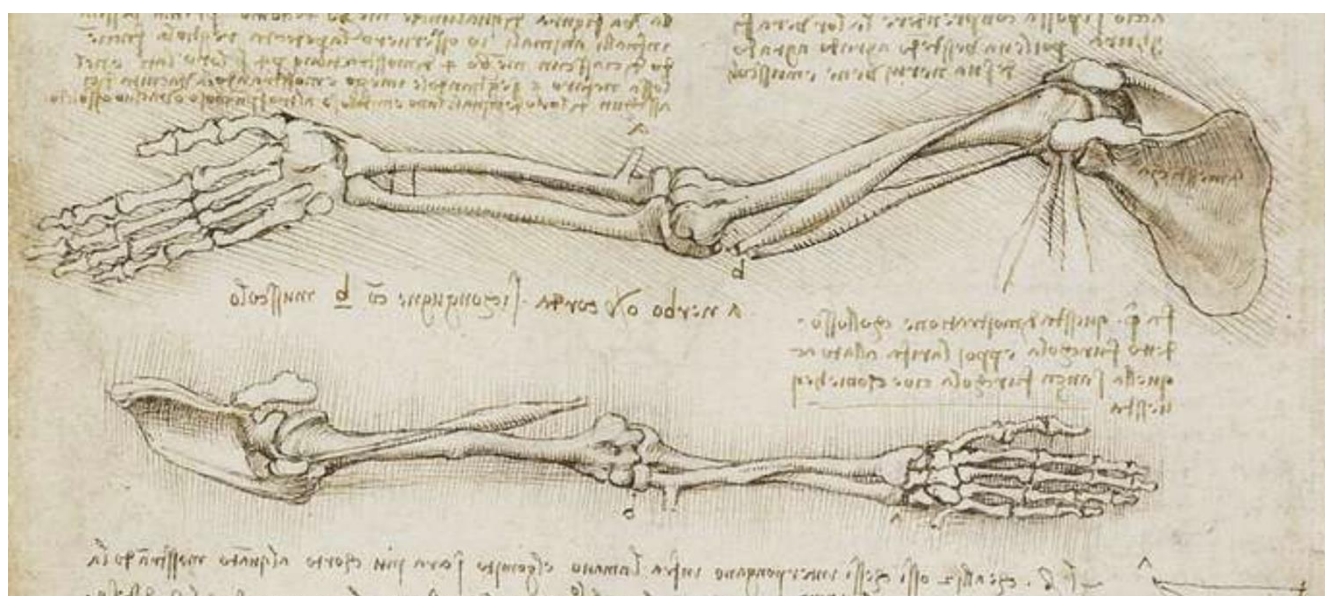
Being truly inclusive requires knowledge in a wide range of human-centered topics. A review of industrial design programs,

even at some of the best design schools, reveals a pattern that's unlikely to get us there. First year classes provide an introduction to design. Required courses may include drawing, color, 3-dimensional modeling, design history, and sometimes a class about art and culture. There may or may not be requirements for elective courses – classes outside the design department. Within the department there may be a single required course focused on human understanding, although it's rare. When it does occur it's just that - a single course. It's not a plan for inclusivity.

Topics to include

In my talks I typically discuss physical aspects of products as they relate to usability. And because there's a lot for students to absorb in the 60- to 90- minute time slot that's usually allocated for the talk, I'm at least hoping to instil awareness of the importance of these topics – or in some cases simply their existence. The talks implant the idea that if products are going to be usable, and inclusive of people who may not have the same physical abilities as others, then an understanding of basic physics, along with the body-mechanics involved even in simple tasks, need to be incorporated early in the design process. My discussion of physics includes a quick overview of weight, gravity, and balance. A poorly balanced hand tool will require more work to operate and can cause someone to be less accurate in its use because the hand is also trying to control its out-of-balance weight. An understanding of leverage is also important. Many hand tools are designed to provide a mechanical advantage. A waiter's corkscrew for instance provides leverage that helps extract a cork from a bottle of wine. It puts waiters' fingers on the mechanically advantaged end of a lever, with the corkscrew situated between the fingers and a pivot point positioned on the far edge of the bottle's mouth. In simple math, the ratio of the distances, pivot-point-to-fingers divided by

pivot-point-to-corkscrew, defines the mechanical advantage. For a waiter's corkscrew, it's usually on the order of 3-to-1. For many products we encounter everyday, leverage determines usability. Some products place a person on the short end of a lever. A broom handle, for instance, puts a person's hands on the short side– a disadvantage in leverage but with the advantage that a shorthand movement allows a wide sweep of the bristle end of the broom. Using a wooden spoon to stir something in a pot is similar – small wrist movements result in lots of stirring.



This is all elementary. However, it's clear that many of the students have never thought about, understood or considered these basic principles. My talk eventually leads to the fact that every bone in a body is controlled by muscles that mechanically are on the short side of a lever. Because of that, forces within our bodies are surprisingly high. Biceps, a major muscle in the upper arm causing the arm to bend at the elbow, is attached to one of two bones in the forearm. The biceps' attachment is close to the elbow's pivot point. The hand, and anything that it's holding, is at the opposite end, far from the pivot point. This requires the biceps to exert a lot of pulling force even for simple actions. Holding a 2-kilogram frying pan readily requires more than 30 kilograms of

muscle pull. (I should be reporting these forces in Newtons, but kilograms may be more relatable by most readers.) Usually these pull forces present no problem; our bodies are designed to work this way. However not all bodies are alike. Some people may not have enough strength and will either be unable to perform common tasks or may tire more readily. Tiring can lead to accidents. Dropping things in the kitchen is a common complaint among people with arthritis, for instance – pinching and gripping can be difficult.

Cognition

Cognitive issues are also important to address –considerations include the fact that:

- *instinct has an overriding influence. We are all pre-wired to react in specific ways.*
- *shapes of a product or a product's components can readily communicate their function. Or not – shapes can either help or be misleading.*
- *preconceptions about a product can cause misuse. A product in a person's past, even if not related to the product at hand, can lead to a person's unexpected behavior.*
- *stress has an effect. Self-injecting a medication can blur thinking – no one likes needles and clear thinking may be clouded by anxiety. Stress can be a factor even for common tasks – the need to take a picture quickly for instance can lead to some wrong button presses and a missed photo.*

Other human-centered topics in psychology important to consider include motivation, behavior, information processing, decision making and memory.

Anthropometry, physiology and other pertinent topics

Variations in the sizes of people (a.k.a. anthropometry, the measure of people) is a factor. Small hands and big hands will interact with a product differently, often to the disadvantage of smaller hands. Smaller hands can mean smaller not-as-strong muscles, and reaches that relegate use to fingertips, not stronger middle segments of the fingers. Understanding basics of biomechanics of the hand – the muscles involved, bones within the hands, range of motion, arm angles, wrist angles and the ability of each finger to contribute to a task, is critical to the design of products that will enable people. It will make those tasks easier, faster, more accurate, or for some people make those tasks possible at all.

The design of a hand tool doesn't stop with the tool – the fingers, wrist, forearm, upper arm and shoulder all need to be taken into account. Considerations for hand tools should start with the shoulder and end at the far “working end” of the tool. The body’s ability needs to be understood first. Mechanics of the hand and arm are rarely part of a design student’s education.

Visibility of a product, its components, or graphics on a product depends on size, color and contrast. For text and symbols, typeface and line weights will affect readability. Knowledge about the physiology of the eye can lead to products that accommodate a wider range of visual abilities, or usability in different lighting situations.

Literacy is another important topic in inclusivity. Instructions can be notoriously difficult to read and interpret. They may also be written in a person’s non-native language. Culture and language

are considerations, especially in the design of products that will be distributed globally.

Social and environmental issues also must be included in design. Products and services exist within a context. Cost as well, since a product can't be inclusive if its price is out of reach.

A brand's positioning is another factor. Successful brands don't just provide products – people are drawn to brands that stand for something. Inclusivity is an important characteristic of some brands. The products they offer need to support their mission, they are the best representatives of a brand's purpose. The business of brands, how a product can add to that brand's equity, is an aspect to be addressed in the creative process.

These are just some of the topics on the critical path to usability and the design of inclusive products. It is doubtful that someone can create successful, inclusive products and services without adequate knowledge in these topics. Few or none of these topics may be covered in current design curriculums.

Design is a group effort, and although there are many people behind the launch of a product the topics mentioned here need to fall within the realm of the designer. Designer Raymond Loewy is famously quoted as saying "Design is too important to be left to designers." We need to turn design education around to change that.

Is design education about to be reinvented?

Can these topics be covered within current curriculums in design schools?

If the thought “design is about people, not things” is to be realized, design education can benefit from a significant re-thinking. Current design curriculums need to be turned upside-down. To set a foundation for a people-based line of thinking, the first year of undergraduate design education should not be about design at all – at least not in the way most programs are set up now. The first year should be used to instill knowledge about people. Before students even start to design objects, services or interfaces, they should understand the people they are designing for. Design education need to establish a more holisticmindset, and establish it early.

The field of design over the last 40 years has focused on the process of design, methods employed to approach a design project step by step. Once considered unique (as evidenced by design firms in the late 1970s and throughout the 1980s diagramming their very similar “unique process”), the process of design has become a commodity, practiced more-or-less the same around the world. Looking ahead, designers need to focus on knowledge in design. Design can be a powerful force for change, but to fully realize its effect on people and society designers need to understand people.

A few schools in industrial design are offering some of this. Carnegie Mellon University’s design department requires industrial students to take a course in psychology in their first semester in the program, although it’s not within the design department. TUDelft requires a course in “Understanding Humans” in the first semester of the industrial design program. Such courses are not commonly required.

Perhaps I'm stating the obvious, that a human-centered education in design should start with the human. The aspirations of inclusive design are to make a difference. Design schools need to revise their programs to truly focus on understanding people. In the first year – don't wait, introduce basic human considerations as early as possible. Save the more traditional design courses for later, when those principles can be applied, and use that knowledge and mindset throughout the rest of the school program. And carry it into practice.

Rethinking design education is not a new idea. In their article "Changing Design Education for the 21st Century" (2020) Michael Meyer and Don Norman open with this:

"Designers are entrusted with increasingly complex and impactful challenges. However, the current system of design education does not always prepare students for these challenges. When we examine what and how our system teaches young designers, we discover that the most valuable elements of the designer's perspective and process are seldom taught."

Can change take place within current industrial design programs? Is it ironic that industrial design, a field promoting itself as master of change and innovation, would have difficulty reinventing itself. Or even shaking off the antiquated name "Industrial." (Although "product design" is commonly substituted, even that term places focus on the product, not the person.)

The publication *she ji*, a journal focused on economics, design and innovation, devoted a recent issue to design education. An article by Meredith Davis and Hugh Dubberly cautions:

"A field is less likely to reinvent itself when practitioners maintain an identity associated with a long-standing view of the field, as they do in design." Davis, M., & Dubberly, H. (2023).

If change cannot be undertaken by a field that bases its value on change and innovation, then it may be quicker to establish an entirely new human-design-based discipline. And come up with a new name for it. Any ideas?

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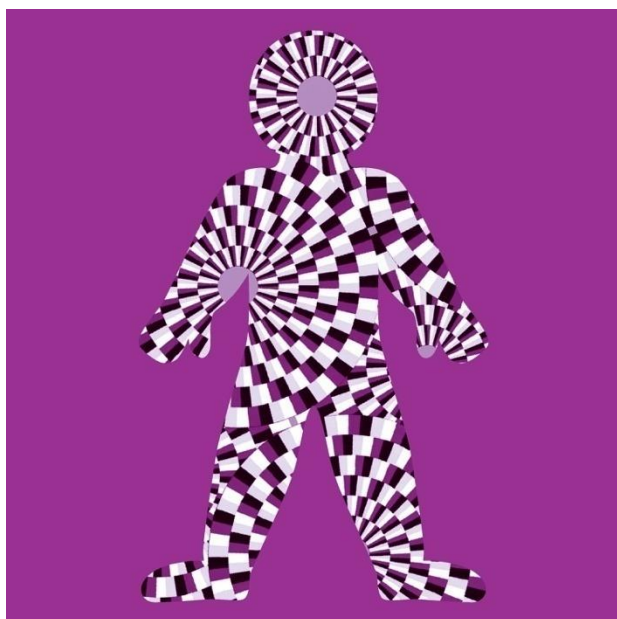
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My chatbot has arthritis

Dan Formosa Ph.D.

As a product designer heavily involved in research I have spoken to and observed hundreds of people in usability studies and interviews, covering a wide range of product categories. A goal for the products, including consumer products and medical devices, among other usability challenges people may have, are designs appropriate for people who have arthritis.

Like many people, over the last year or so I have logged onto ChatGPT and Google Gemini for information, asking questions related to either professional or personal projects. Most were short Google-like question and answer sessions.

My assignment as editor for this issue of Design For All was to enlist a number of authors. For their articles authors reached out to various people for interviews. For this article I thought I would try an experiment. I reached out to a chatbot, Google Gemini, to see what AI can offer in an interview. Not just a quick information search, my plan was to carry on an extended conversation. In experimental fashion I started by asking if he/she/it (not sure of the proper pronoun for a chatbot) could respond as someone who has arthritis. I wasn't sure if this was possible, or what it would yield. Here is that session.

By no means do I regard chatbots as an alternative to real people (I'm a real-people person.) And as you'll see, the chatbot agrees. However, in conversation I was surprised at how knowledgeable the chatbot was. And how chatty!

My expectations were moderately high to start. But the chat was more informative, and more fun, than I expected. I did not edit at all my prompts or any of Gemini's responses. Here's that session:

My conversation with Gemini

Dan: *Are you able to respond to questions as if you are someone with a disability such as arthritis?*

Gemini: I can certainly try! To respond authentically, it would be helpful to know what type of arthritis and the severity. Arthritis affects people differently, but I can share some general responses that capture some of the challenges people with arthritis experience.

For example, if you ask me "Can you open that jar for me?" I might respond with:

- "Ugh, my hands are feeling stiff today. Would you mind giving that a twist? My arthritis is acting up."

Or, if you ask me "What do you like to do for exercise?" I might say:

- "I enjoy going for walks, but long distances can be tough on my knees. Low-impact activities are my friend these days."

Let me know if you have a specific scenario or question in mind, and I will do my best to craft a response that reflects the experience of someone with arthritis.

It's important to remember that everyone with arthritis is an individual, and their experiences will vary.

Dan: *Arthritis is sometimes characterized into three levels – slight, moderate and severe. Can you respond as someone who has moderate arthritis?*

Gemini: Absolutely! Having moderate arthritis can definitely make things interesting.

For instance, if you ask me to come for a hike, I might say:

- "I'd love to join you, but those hills might be a bit much for my knees today. Maybe we could find a flatter trail? There's this great path by the river I've been wanting to check out."

Or, if you hand me something heavy, I might respond with:

- "Oh, thanks! Let me just grab that with two hands – my wrists aren't too keen on carrying a lot these days."

On good days, I might be able to keep up with most activities, but there will definitely be some adjustments I need to make to manage my pain and stiffness. I also tend to get tired faster, so pacing myself is important.

Is there anything else you'd like to know about what it's like to have moderate arthritis?

Dan: *What are some of the common challenges you experience on a day-to-day basis?*

Gemini: With moderate arthritis, some days are definitely better than others. Here are a few challenges I face on a fairly regular basis:

- **Morning stiffness:** The first hour or so after waking up can be rough. My joints, especially in my hands and knees, feel like they're filled with cement. Simple tasks like getting dressed or making breakfast can take a bit longer as I wait for things to loosen up.
- **Pain with activity:** I can still be active, but I have to be mindful of it. Walking is great, but those hills you mentioned? Yeah, they can definitely trigger some aches. I also have to be careful not to overdo it, or I'll pay the price later with soreness and stiffness.
- **Surprise limitations:** There are times when I reach for something or go to do something and my body just says "nope." Maybe a jar lid is too tight, or a curb seems higher than usual. It can be frustrating, but I've learned to have some backup plans and be flexible.
- **Fatigue:** Even on good days, I tend to tire out faster than people without arthritis. Planning activities often involves factoring in rest breaks. Sometimes, a simple trip to the grocery store can leave me needing to put my feet up for a while.

- **Impact on sleep:** Sometimes the pain or discomfort can make it hard to get a good night's sleep. This lack of sleep can then make the next day's challenges even tougher. Finding ways to relax and manage pain before bed is important.
- **Mental game:** Arthritis can be a bit of a mental battle. There are days when the pain or limitations can get me down. But I try to focus on what I can do, stay active, and not let it define me.

These are just some of the things I deal with on a day-to-day basis. The good news is that there are ways to manage arthritis, and I've found that a combination of medication, exercise, and a positive attitude goes a long way.

Dan: *What about activities in the kitchen - cooking or preparing food, cleaning?*

Gemini: The kitchen can definitely be a battleground for someone with moderate arthritis. Here's a glimpse into what it might be like for me:

- **Chopping and prepping:** Gripping a knife for long periods can aggravate my hand and wrist pain. I try to use tools with thicker handles for better leverage, and take breaks to avoid overdoing it. Sometimes, I enlist help from family members or pre-cut veggies to save my hands the stress.
- **Lifting heavy pots and pans:** Those hefty cast iron skillets might look fancy, but they're not my friend. I've switched to lighter weight cookware made from aluminum or even silicone. Double-handled pots are a lifesaver, as they distribute the weight more evenly.

- **Reaching for things:** Those top shelves? Yeah, not happening most days. I've reorganized my cabinets to keep frequently used items within easy reach, at eye level or below. For higher shelves, I use a grabber tool to avoid that painful stretch.
- **Standing for long periods:** Kitchen duty often involves a lot of standing, which can be tough on my knees. I've invested in a comfy anti-fatigue mat to provide some cushion and reduce stress on my joints. Also, I pull up a stool to perch on while prepping or doing dishes whenever possible.
- **Cleaning:** Scrubbing greasy dishes can be a nightmare for sore hands. I wear padded gloves for some protection, and try to use hot, soapy water to loosen grime so I don't have to scrub as hard. Anything with a non-stick surface is a godsend!
- **Planning is key:** Spontaneous cooking sessions are less frequent these days. I tend to plan meals in advance, considering what prep work I can manage without too much strain. Using slow cookers or one-pot meals are lifesavers on days when my arthritis is acting up.

It takes a little more creativity and planning to navigate the kitchen with arthritis, but there are ways to make it work. Sometimes, a little help from family or friends goes a long way too!

Dan: *Are you having any trouble with specific items in the kitchen?*

Gemini: Sure, with moderate arthritis, some kitchen items can cause more trouble than others. Here are a few that cause me problems:

- **Jar openers:** Those lids can be like torture chambers for my hands! Twisting them can be difficult and painful. I rely on jar openers with rubber grips or silicone pads to give me a better hold and more leverage.
- **Heavy can openers:** The squeezing motion can aggravate my hand and wrist pain. An electric can opener is a lifesaver and eliminates the need for gripping or twisting.
- **Peeling fruits and vegetables:** Gripping a small peeler can be tricky, and sometimes requires a lot of hand strength. I use peelers with large, soft handles for better leverage, or even silicone oven mitts for extra grip.
- **Small, lightweight cutlery:** These can be difficult to hold onto, especially with stiff or sore hands. Utensils with thicker, ergonomic handles are much easier to manage.
- **Anything requiring a pinch grip:** Opening certain packages or handling small containers can be a challenge. I try to use scissors whenever possible to avoid pinching with my thumb and forefinger.

By using adaptive tools and making some substitutions, I can still get by in the kitchen. The key is to find what works for me and to not be afraid to ask for help when I need it.

Dan: *What about pots and pans?*

Gemini: Here are some challenges I face with pots and pans due to moderate arthritis:

- **Heavyweight cookware:** Cast iron skillets, Dutch ovens, even full stock pots of water can be heavy and cumbersome to lift, especially with sore wrists or hands. I've opted for lighter options whenever possible, like aluminum or even silicone cookware.
- **Unbalanced pots:** A pot with a single handle can put all the weight on one arm, which can be tough on my shoulders. Double-handled pots are a lifesaver, as they distribute the weight more evenly and make lifting and pouring easier.
- **Tight-fitting lids:** Heavy or cumbersome lids can be difficult to grip or remove, especially if my hands are stiff. I look for lids with large knobs that are easy to grasp, or even silicone lids that create a seal without needing to be pressed down hard.
- **High sides:** Peering over high pot sides to stir or check food can strain my neck, especially if I'm already dealing with pain. I tend to use wider, shallower pans whenever possible, or I use a grabber tool to stir or toss food without having to reach in too far.
- **Hot handles:** Grabbing a hot pot handle can be painful, especially if I have limited grip strength. I use silicone potholders that offer better heat protection and a secure grip. Some pans even have heat-resistant handles which is a big plus.

Dan: *If a pinch grip is difficult, do you find that you are dropping things more frequently?*

Gemini: Absolutely, having difficulty with a pinch grip is a major contributor to dropped items. Here's why:

- **Reduced control:** The pinch grip relies on the thumb and fingers working together precisely. With arthritis, stiffness, weakness, or pain can make that coordination challenging. My grip feels less secure, so things can easily slip out of my grasp.
- **Unexpected weakness:** Arthritis pain or stiffness can sometimes come on suddenly. I might be holding something and then experience a twinge that causes me to loosen my grip unintentionally, leading to a drop.
- **Everyday tasks:** Picking up a cup, grabbing a phone, even holding onto silverware all rely on a pinch grip. When that grip is compromised, even the most routine tasks can become precarious, and drops become more frequent.
- **Frustration and fatigue:** The constant struggle to maintain a good grip can be tiring and frustrating. This fatigue can sometimes lead to carelessness or moments of inattention, which can also contribute to dropped items.

It's definitely a challenge, and something I have to be constantly aware of. That's why I try to use tools that can help, like grippers for jars or silicone pads for utensils, to give me a better hold on things. I also take my time and focus on my grip when picking things up.

Even with these strategies, dropped items are still a reality of life with moderate arthritis. But it's important to stay positive and not let it discourage me. I just pick things up, dust myself off (metaphorically speaking!), and keep going.

Dan: *What's your name and gender?*

Gemini: I don't actually have a name or gender! As a large language model, I am not a person. I can respond to prompts and

answer your questions in a way that simulates a person with a particular background or disability, but I don't have my own experiences or feelings.

Is there anything else you'd like to know about how arthritis might impact daily life?

Dan: *Are you responding as a male or female, and does gender make a difference for common kitchen tasks?*

Gemini: I apologize, attributing a gender to myself wasn't appropriate. You're right, gender itself likely doesn't cause a significant difference in the way people experience common kitchen tasks.

Social norms and cultural expectations might influence how often people perform certain tasks, but the physical limitations of moderate arthritis would apply regardless of gender.

Studies do suggest a slight difference in approach:

- **Gadget Use:** Some research suggests men might be more inclined to use specialized kitchen gadgets, while women may rely more on basic utensils.
- **Spice Preference:** There may be a difference in commonly used spices, with men favoring bolder flavors and women leaning towards everyday spices.

However, these are generalizations, and the most significant factor impacting kitchen tasks with arthritis is likely individual preferences and cooking styles, not gender.

Dan: *What about age?*

Gemini: Age can definitely play a role in how arthritis affects someone in the kitchen. Here's how it might differ for someone younger versus someone older with moderate arthritis:

Younger (30s-50s):

- **Overall Strength and Endurance:** Younger individuals with arthritis might still have a bit more overall strength and stamina compared to older adults. This could allow them to manage tasks like lifting heavier pots or stirring for longer periods.
- **Work Adaptations:** Younger people might still be actively working, and their jobs might influence their ability to handle kitchen tasks. A physically demanding job could exacerbate arthritis symptoms, making kitchen activities more challenging.
- **Activity Level:** Younger adults might generally have a higher baseline activity level, and this could translate to a better tolerance for some kitchen tasks despite arthritis. They might be able to push through stiffness or pain for a short period to get things done.

Older (60s+):

- **Joint Deterioration:** As we age, the natural wear and tear on joints can be more pronounced. This could mean more limitations in flexibility, range of motion, and overall strength, making even simple kitchen tasks more difficult.
- **Multiple Conditions:** Older adults are more likely to have other health conditions alongside arthritis. These can combine to create additional challenges in the kitchen. For instance, reduced eyesight might make chopping vegetables a safety hazard.
- **Reduced Recovery Time:** Recovery from exertion or pain might take longer for older adults. This could limit their

ability to perform long stretches of kitchen work and necessitate more frequent breaks.

It's important to remember that these are just general trends. There will always be individual variations. A very active 65-year-old with well-managed arthritis might navigate the kitchen with more ease than a less active 40-year-old with severe symptoms.

Dan: *My previous questions were about the kitchen, but are there other common tasks that may be difficult?*

Gemini: Absolutely! Arthritis, especially moderate arthritis, can make a variety of everyday tasks more challenging. Here are some common areas where you might see difficulties:

Personal Care:

- **Dressing:** Reaching for buttons, zippers, or putting on socks can be difficult with stiff hands or sore shoulders. People with arthritis often look for clothes with easy-open closures like elastic waistbands or slip-on shoes.
- **Grooming:** Simple tasks like brushing hair, shaving, or applying makeup can be hindered by pain or limited range of motion in the hands and wrists. Tools with long handles or ergonomic grips can be helpful.
- **Bathing:** Getting in and out of the shower or tub can be risky, especially with slippery surfaces. Grab bars, shower seats, and hand-held shower heads can all improve safety and independence.

Daily Activities:

- **Housework:** Activities like vacuuming, sweeping, or mopping can be strenuous on joints, especially knees and

hips. Using lighter weight tools or delegating chores can help.

- **Climbing stairs:** Stairs can be a major obstacle for people with arthritis in their knees or hips. Handrails are essential, and some people may need to consider installing a stairlift for their home.
- **Carrying groceries:** Lifting heavy bags can be a recipe for pain. Shopping carts or using grocery delivery services can be lifesavers.

Leisure Activities:

- **Gardening:** Tasks like digging, weeding, or pruning can be difficult with limited hand and wrist mobility. Raised garden beds and ergonomic tools can help make gardening more manageable.
- **Sports and exercise:** While staying active is important with arthritis, high-impact activities like running or jumping might be too harsh on joints. Low-impact exercises like swimming, walking, or yoga are often better options.

It's important to remember that these are just a few examples, and the specific difficulties will vary depending on the type and severity of arthritis, as well as the individual's overall health and lifestyle. However, with a little creativity and some adjustments, most people with arthritis can still find ways to manage these daily tasks and live fulfilling lives.

Dan: *For dressing (buttons, zippers, etc.) have you found any products that can assist, or that are easier to use when dressing yourself?*

Gemini: Yes, there are several products that can assist people with arthritis when dressing, especially with buttons and zippers. Here are a few of the most common:

- **Button hook:** A button hook is a small, handheld tool with a curved hook on one end. It helps you to loop the buttonhole over the button without having to use your fingers or pinch grip.



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americanduchess.com

Button hook

- **Dresser helper:** A dressing helper is a long, narrow tool with a hook on one end and a gripper on the other end. The hook can be used to pull up zippers and the gripper can be used to grab clothing and pull it on or off.



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www.amazon.com

Dresser helper

- **Reachers:** Reachers are long-grabbing tools that can be used to pick up clothing from the floor or to pull on socks and shoes. They come in a variety of lengths and styles.



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Reachers

- **Elastic shoelaces:** Elastic shoelaces can be used to replace regular shoelaces. They allow you to put on and take off shoes without having to tie or untie the laces.



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amazon.com

Elastic shoelaces

- **Clothes with easy-open closures:** Look for clothes with features that make them easier to put on and take off, such as shirts with zipper closures or pants with elastic waist bands.

These are just a few examples, and the best products for you will depend on your specific needs and preferences. It is also a good idea to talk to your doctor or occupational therapist for recommendations.

Dan: *Do you have any complaints or difficulties when using a smartphone?*

Gemini: Absolutely! Using a smartphone with moderate arthritis can definitely be frustrating at times. Here are some of the common challenges I face:

- **Small screen and buttons:** Tiny icons and close-together buttons on the touchscreen can be difficult to see and target accurately, especially with stiff fingers. Pinching and zooming can be tiring and sometimes imprecise.
- **One-handed operation:** While many tasks can be done with one hand, some require swiping or pinching with both thumbs, which can be painful or difficult with limited dexterity.
- **Typing:** Swiping or tapping on the keyboard can be awkward and slow, especially if my fingers are swollen or stiff. Swype keyboards or voice recognition can be helpful alternatives, but they aren't perfect.
- **Weight and grip:** Smartphones can be surprisingly heavy, and holding them for extended periods can strain my hands and wrists. Cases with grippy textures or pop sockets can

help improve my grip and reduce the risk of dropping the phone.

- **Stiffness and responsiveness:** The first thing in the morning, my hands might be stiff, making it hard to use the touchscreen accurately right away. I've learned to be patient and wait for things to loosen up a bit before using my phone extensively.

These challenges can definitely make using a smartphone less enjoyable and sometimes even a bit stressful. However, there are some features and settings that can help:

- **Accessibility settings:** Most smartphones have built-in accessibility features that can be helpful for people with arthritis. These can include things like increased font size, bolder text contrast, and voice control options.
- **Large-icon mode:** Many phones allow you to switch to a "large-icon mode" which makes app icons and text larger and easier to see and tap on.
- **Voice assistants:** Virtual assistants like Siri or Google Assistant can be a great way to control your phone with your voice instead of your fingers. You can use voice commands to make calls, send texts, set reminders, and more.
- **Stylus pen:** Using a stylus pen can improve your accuracy when tapping or swiping on the screen, especially for tasks like handwriting recognition or drawing.

By using these tools and being patient with myself, I can still use my smart phone to stay connected, get things done, and even have some fun. Arthritis might slow me down a bit, but it doesn't have to stop me from using the technology I enjoy!

Dan: *What about other electronics in your house – television controls for example?*

Gemini: You're right, television remotes can definitely be a challenge with moderate arthritis. Here's how they can cause some trouble:

- **Small buttons:** Those tiny buttons on a standard remote can be difficult to grip and press, especially if my fingers are stiff or swollen. My thumbs might not have the dexterity to hit the exact center of the button every time, leading to frustrating missed presses.
- **Multiple buttons:** Having so many buttons crammed together can be confusing and overwhelming. Trying to find the right button quickly can be a struggle, especially if the labels are small or not backlit.
- **Shape and weight:** Traditional remotes are often thin and lightweight, which might sound good, but they can be tricky to hold onto securely with limited hand strength. A smooth, plastic surface can also be slippery for arthritic hands.
- **Reaching for the remote:** Bending over or reaching for the remote on the coffee table can be painful for sore shoulders or a stiff back. Sometimes, the remote seems to mysteriously disappear just when I need it most!

Here are some ways I've learned to cope with these remote woes:

- **Big Button Remotes:** These lifesavers have large, clearly labeled buttons that are easy to see and press. They might have fewer buttons overall, focusing on the most commonly used functions. Some even have backlighting for night time use.

- **Universal Remotes:** These can be programmed to control multiple devices like the TV, cable box, and sound system. This reduces the clutter of multiple remotes and allows for fewer buttons to learn.
- **Voice Control:** Many TVs and cable boxes now have voice control features. This allows me to control the volume, change channels, or even search for programs using my voice, eliminating the need for the remote altogether.
- **Remote Holsters:** These handy devices attach to the armrest of your couch or chair, keeping the remote within easy reach and preventing those frustrating "lost remote" moments.
- **Smartphone Apps:** Many cable providers and streaming services offer apps that allow you to control your TV with your phone. This can be a good option if my hands are feeling particularly sore on a given day.

By utilizing these options, I can navigate the television with more ease and less frustration. Arthritis might make using the remote a bit of a chore, but a little creativity and some helpful tools can go a long way!

Dan: *Are there any problems using appliances, such as a microwave oven or a dishwasher*

Gemini: Even with moderate arthritis, using appliances like microwaves and dishwashers can be manageable, but there can be a few hurdles to overcome. Here's how:

Microwave:

- **Reaching for buttons:** The control panel on a microwave, especially if it's mounted overhead, can be difficult to reach

for someone with limited shoulder mobility. Microwaves with lower-mounted controls or those with accessible buttons on the door can be easier to use.

- **Setting the timer:** Those tiny buttons for setting the timer can be fiddly with stiff fingers. Look for microwaves with larger buttons or even touchscreens that allow for easier selection of time.
- **Lifting heavy dishes:** Taking a hot dish out of the microwave can be tricky, especially if it's heavy and awkward to handle. Using microwave-safe potholders or mitts with good grip is essential. Consider using lighter weight dishes in the microwave whenever possible.

Dishwasher:

- **Loading and unloading:** Bending down to load and unload the dishwasher can strain your back and knees. Pull-out racks at the bottom can make reaching the back easier. You can also use a stool to sit down while loading or unloading.
- **Heavy dishes:** Similar to the microwave, lifting heavy dishes in and out of the dishwasher can be difficult. Consider using a dishwasher basket specifically designed for silverware and lightweight items, reducing the weight you need to lift in each hand.
- **Rack adjustments:** Adjusting the racks in the dishwasher can be tough if the knobs are stiff or require a pinching motion. Look for dishwashers with easy-grip handles or levers for adjusting the racks.

Dan: *If I am designing a product, such as a basic hand tool, how can I best develop new ideas that can help people with arthritis?*

Gemini: Here are some general tips that can help with using appliances and managing arthritis:

- **Keep frequently used items within easy reach:** Store dishes, utensils, and cleaning supplies you use often in lower cabinets or drawers to avoid excessive bending or reaching.
- **Utilize adaptive tools:** There are many tools available to help people with arthritis manage everyday tasks. For example, gripper pads can improve your grip on slippery surfaces or jar openers can help you twist lids without straining your hands.
- **Delegate tasks:** Don't be afraid to ask for help! If you live with family or have close friends, delegate tasks like loading the dishwasher or reaching for high cabinets.
- **Listen to your body:** Don't try to push yourself too hard. If you're feeling pain or stiffness, take a break and come back to the task later.

By being mindful of these challenges and utilizing some simple strategies, you can still use appliances like microwaves and dishwashers effectively, even with moderate arthritis.

Here are some key strategies you can use to develop new ideas for hand tools that can help people with arthritis:

Understanding the User:

- **Research:** Conduct user research to understand the specific challenges faced by people with different types and severities of arthritis.
 - Talk to occupational therapists or doctors who specialize in arthritis.

- Look for online forums or support groups for people with arthritis.
- **Observe and Prototype:** Observe people with arthritis using existing tools. Watch for any difficulties they encounter and identify areas for improvement. Develop low-fidelity prototypes (e.g., cardboard cutouts) to test different design concepts with potential users and get their feedback.

Focus on Pain Points:

- **Grip and Dexterity:** Many people with arthritis struggle with grip strength and limited dexterity. Focus on designing tools with large, comfortable handles that are easy to grip and require minimal pinching or twisting motions. Consider incorporating rubberized or textured surfaces for improved grip.
- **Reduced Reach:** Reaching for tools or applying a lot of force can be difficult. Design tools that are lightweight and require less effort to use. Explore features like extendable handles or built-in levers to reduce the reach and force required.
- **Minimize Stress:** Repetitive motions or awkward postures can exacerbate pain. Design tools that promote a neutral hand position and reduce the need for sustained force or awkward grips.

Think Beyond the Tool:

- **Multifunctionality:** Consider designing tools that can serve multiple purposes, reducing the number of tools needed and minimizing the need to switch grips or reach for different tools.

- **Ease of Use:** Design with simplicity in mind. Clear instructions, minimal moving parts, and easy cleaning are all important features for people with arthritis.
- **Customization:** One size does not fit all. Explore features that allow for customization, such as adjustable handles or interchangeable attachments, to cater to different hand sizes and grip strengths.

Examples of Design Features:

- **Rocker blades or rollers:** These can replace the need for squeezing motions on tools like can openers or jar openers.
- **Trigger grips:** These can be easier to use than traditional squeeze grips for people with limited hand strength.
- **Magnetic pick-up tools:** These can eliminate the need to bend down and pick up dropped items.
- **Weighted bases:** These can provide stability for cutting tools or other items that might be difficult to hold steady.

Additional Tips:

- **Partner with Occupational Therapists:** Collaborate with occupational therapists who can provide valuable insights into the specific needs of people with arthritis and the types of tools that can be most helpful.
- **Consider Aesthetics :** Don't sacrifice design for functionality. Create tools that are not only helpful but also visually appealing and comfortable to use.
- **Test and Refine:** Continuously test your prototypes with potential users and incorporate their feedback into the design process.

By following these strategies and focusing on the specific needs of people with arthritis, you can develop innovative hand tools that make everyday tasks easier and less painful.

Dan: Thank you, that was great. Can I come back to you later with more questions after I have had a chance to think about your responses?

Gemini: You're welcome! I'm happy to help in any way I can. Absolutely, feel free to come back with any further questions you may have about arthritis or designing products for people with arthritis. I will do my best to answer your questions based on the information and data I have been trained on.