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INTRODUCTION

In the United States, arthritis is the #1 cause of disability, affecting nearly 60 million adults and hundreds of thousands of children. This complex disease can cause chronic, debilitating pain — and make daily activities difficult to do — while also impacting physical and social wellness and mental health. People of all ages, races and sexes live with arthritis.

Arthritis symptoms include pain, stiffness, swelling and diminished range of motion in joints. Symptoms vary, from mild to severe, and may come and go, getting progressively worse over time. Arthritis can also cause permanent joint damage, often leading to immobility. In addition, arthritis can affect the heart, lungs, kidneys, eyes, skin and other organs.

For almost eight decades, the Arthritis Foundation has led the way in supporting people with arthritis and their caregivers. As the largest nonprofit organization focused on arthritis and related conditions, we've played a key role in the development of groundbreaking arthritis treatments — and have successfully advocated for policies and laws that make health care more accessible and affordable for arthritis patients.

We also create life-changing resources that help patients take control of their disease. And we nurture a vibrant, caring community where they can connect with others and know they're not alone.



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EASE OF USE PRODUCTS AND PACKAGING

The Arthritis Foundation's Ease of Use Certification program recognizes products and packaging that have been tested, approved and certified as easy to use for people who live with arthritis and chronic pain.

Consumer products and packaging are often not designed to meet the needs of those challenged by arthritis and chronic pain. When easy-to-use designs are implemented, products and packages are made easier to use for the arthritis community, which means they are easier to use by everyone.

Each product and package considered for Ease of Use is first independently tested by the Intuitive Design Applied Research Institute (IDARI). Upon receiving a favorable review, they are then eligible to license the Ease of Use Certified seal, which may be incorporated in all marketing initiatives as a shelf differentiator, in both retail and e-commerce, as well as become part of the Arthritis Foundation's Ease of Use annual marketing strategy.



Did You Know?

72% of consumers said they would switch brands if a product/package was certified as Ease of Use Certified. - Nielsen Ease of Use Survey 2016

Both the consumer and corporate sectors are gaining great value in updated designs of products and packages that are easy to use. Carrying the seal, brands like Pilot® Pen, Nexium, Advil®, Duracell®, IMAK®, SafeStep and others are seeing sales that outpace their competition. Many brands use the seal in presentations and buyer meetings, along with marketing in print, digital and television.

People living with arthritis and chronic pain also make shopping decisions when they see the item has been certified as easy to use. Easier to use designs are easier for everyone, whether living with chronic pain or not, and often become a shelf differentiator.

"I trust all products that are labeled Ease of Use. My absolute favorite that I use the most is the Advil® Easy Open Arthritis Cap. I've had arthritis for almost 20 years, and I've always struggled to open a medicine bottle cap. Advil made it so much easier. My second favorite is the Ezy Dose® Pill Organizer. This helps me organize my meds and have easier access to them, despite any pain I may have in my hands. I'm grateful for the partnerships the Arthritis Foundation has made to create products that make life easier with arthritis."

–Ashley Nicole, autoimmune health coach and master trainer, diagnosed with rheumatoid arthritis at age 27

Intuitive Design Applied Research Institute

The Intuitive Design Applied Research Institute, LLC (IDARI), assists in identifying user needs and scientifically evaluating consumer product and packaging solutions. IDARI offers many research and evaluation services, specializing in objectively measuring human performance that delivers key insights. This, in turn, drives innovation — especially for the needs, aspirations and latent demands of consumers dealing with arthritis, chronic pain and other functional limitations.

IDARI serves as the official consumer product Ease of Use test lab for the Arthritis Foundation. A favorable evaluation by IDARI qualifies the manufacturer for inclusion in the Arthritis Foundation's Ease of Use Certification program.

Dr. Brad Fain, IDARI founder and Georgia Tech Regents' Researcher, has more than three decades of experience researching human factors engineering and design. From Ease of Use evaluation and universal design studies, to ethnographic research and consumer product design, Dr. Fain founded IDARI to conduct usability and accessibility testing for the Arthritis Foundation and other entities across the globe. At Georgia Tech, his research has spanned projects for the U.S. Department of Defense to manufacturers of critical health systems. He established the Accessibility Evaluation Facility at Georgia Tech, which performs objective accessibility evaluations of workplace information technology for both industry and government customers. Learn more about Dr. Fain and his research at idarinstitute.com.



Dr. Brad Fain



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PARTNERSHIP

The Arthritis Foundation is the largest nonprofit organization dedicated to the prevention, control and cure of America’s No. 1 cause of disability. The Arthritis Foundation champions the fight to conquer arthritis through life-changing science, resources, advocacy and community connections. Taking diversity, equity and inclusion very seriously, the Arthritis Foundation strives to empower all people with arthritis to live a better lifestyle and remove barriers that limit quality of life. As the leading expert in Ease of Use design certification, the Arthritis Foundation helps generate more than \$100 million in annual sales of products and packages carrying the Ease of Use seal.

Target is one of America’s leading retailers and an iconic brand with a single purpose: to help all families discover the joy of everyday life. Diversity, equity and inclusion are part of Target’s core values, shaping culture and driving business. At the heart of this endeavor is the Owned Brand Product Design & Packaging organization. This team designs and engineers products and packaging for an industry-leading portfolio of over 45 Target owned brands. Inclusive design and accessibility improvements have been long-term goals of this team. Target collaborates with external partners to advance their owned brands portfolio with exclusive designs only found at Target.

This collaborative partnership is driving innovation on product and package designs. The mutual goal is to provide products and packages that are easier to use for people living with arthritis and chronic pain, plus other consumers who are also looking for easy-to-use items. Together, we want to help all families discover the joy of everyday life, driving innovation that leads to life-changing satisfaction.

This Ease of Use Design Guide provides the first guidelines developed in the United States, offering resources for engineers and designers in the requirements definition and design development stage. Our collaboration is leading the way in design accessibility.

This innovative partnership of the Arthritis Foundation, Target and IDARI has been a collaborative effort of industry experts in the Ease of Use design space — with Target funding the research and contributing to the illustrations, photographs and graphic design of these guidelines.



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HIGH-LEVEL CONSIDERATIONS: ISSUES AND RECOMMENDATIONS

Packaged items are too heavy. People with arthritis can have difficulty holding and transporting heavy items. Items over 5.0 pounds can be difficult to carry with one hand. If items exceed 5.0 pounds, consider adding design elements to facilitate a two-handed hold. Items over 10.0 pounds can be difficult to carry regardless of handle placement.

The linear force required is too high. People with arthritis can experience pain when asked to apply a linear force to a design element. Consider requiring less than 3.0 pounds of linear force for design elements meant to be operated with a single finger or designed to be pinched between two fingers. Consider requiring less than 5.0 pounds of force for design elements that are to be operated by multiple fingers or a palm press.

The rotational force requirement is too high. People with arthritis may have difficulty rotating design elements, such as twist off closures. The amount of force a user can apply to a rotating design element will depend on multiple factors, such as the diameter, height, coefficient of friction and the knurling pattern of the element. Small-diameter and large-diameter rotating design elements can be particularly difficult to operate. Avoid design element shapes or knurling patterns that directly apply pressure to finger joints during rotation.

Users become fatigued after prolonged usage. Users with arthritis may become fatigued when using products that must be held or actuated repeatedly over a prolonged period. When designing the product for extended use, reduce the number of individual actions required and minimize the amount of effort required for each action.

Use of the product causes joints to be placed in an uncomfortable position or posture. Some products require users to articulate their joints in an uncomfortable position. Whenever possible, design the product to maintain a neutral position of the wrist joint. Do not require users to extend their arms above shoulder height.

Use of the product causes painful pressure across finger joints. Ridges, bumps and other small-radius protrusions along the graspable area of the product can increase pressure along painful finger joints. Ensure that all graspable areas are designed to distribute the load across the entire grasp point so that pressure is not concentrated on individual finger joints.

Use of the product requires an excessive grip span. Some users with arthritis have increasingly diminishing grip strength once the grip span exceeds 2.5 to 3.0 inches. Design graspable items that require user strength to not require excessive grip span.

The product requires the use of a tool. Users with arthritis are more likely to injure themselves if interacting with the product requires a sharp instrument like scissors or a knife. Consider not requiring the use of a tool to open or interact with the product.

Avoid requiring simultaneous actions. Some users with arthritis have difficulty performing two actions at the same time, such as rotating and pinching a closure. If the use of the product requires multiple actions, design the product in a way that those actions can be performed sequentially.

Avoid sharp edges. Sharp edges can create a hazard or may be uncomfortable if users are required to apply force to the edge. Consider rolling metal edges or finishing plastic edges with a dull surface.

Bottles & Bases

Bottles and bases are the vessels used to contain the product. They are available in a wide variety of shapes and sizes, but a limited number of material segments, primarily plastics, metal, glass and pulp. This section reviews design considerations for bottles without handles, bottles with handles, tubs, fiber composite cans, jars and aluminum cans.



BOTTLES & BASES OVERVIEW

Rigid packaging is a category of packaging that does not flex or bend. It includes bottles, boxes, cans and jars made of materials such as paperboard, plastic, glass and metals. Often, rigid packaging is used to protect and contain fragile materials and liquids. Many of these packages are part of a packaging assembly with a cap, closure, dispenser or other mechanism to dispense the product.

This guide focuses on high-volume rigid packaging bottles and bases used in the United States in the early 2020s. Rigid packaging used for medication and health care is not included in this guide due to the complexity of the topic. This topic is under consideration for a future guide. This is part of a series of guides covering rigid bottles and bases, rigid components, films and pouches, sealed trays and cards, and boxes and bags. This guide starts with a review of the high-level issues and recommendations across all packaging. Following this section, the guide discusses optimum design guidelines, common issues and recommendations for rigid packaging bottles and bases.

BOTTLES WITHOUT HANDLES

Bottles without handles are a type of rigid packaging commonly used for food and beauty and household cleaners. Examples include ketchup, dish soap and body wash bottles. These containers are designed to be held in one hand while dispensing the contents. Most of these packages are designed to be inverted while dispensing the contents.

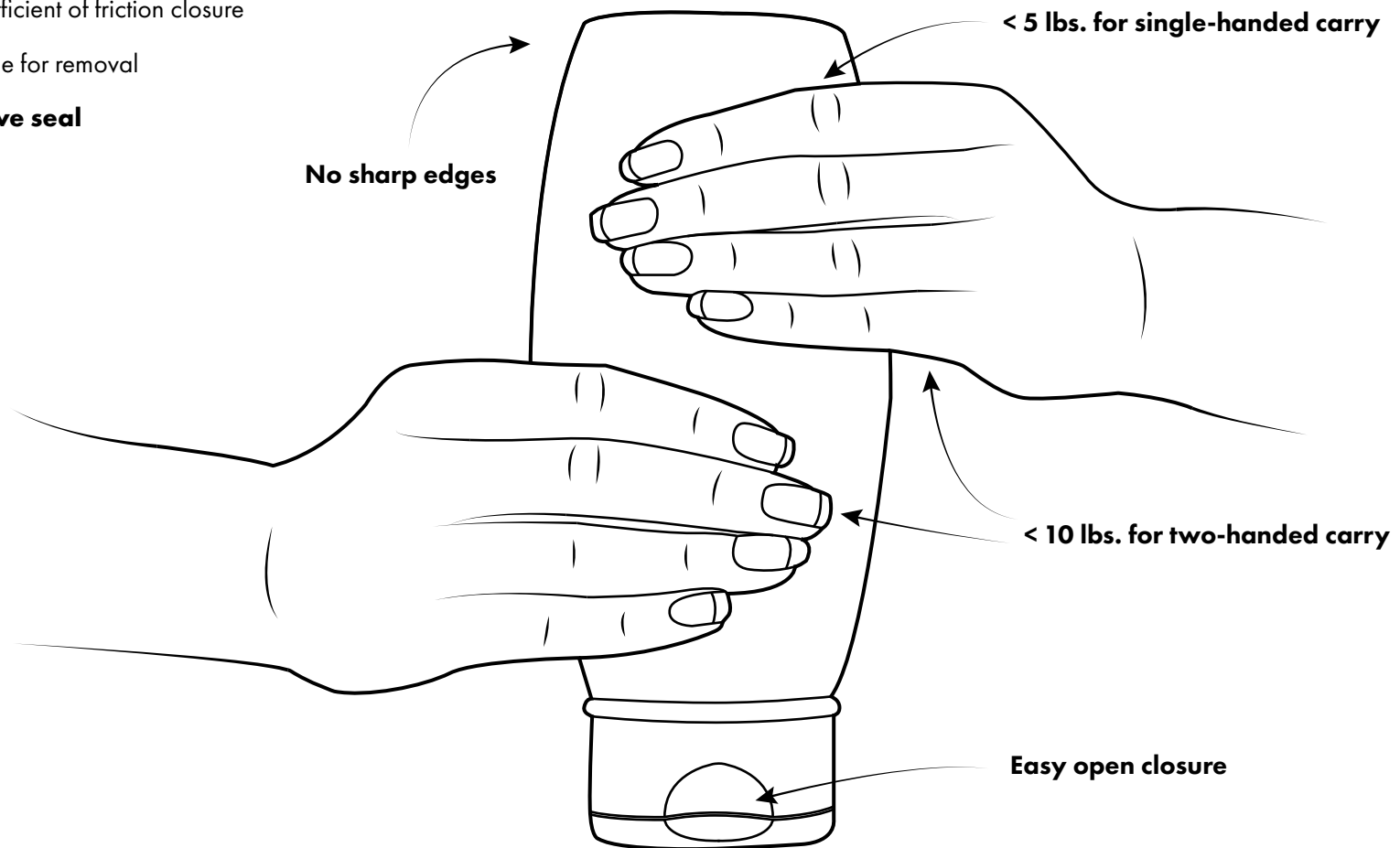
Examples of Bottles Without Handles



Optimum Bottles Without Handles Design Guidelines

Recommendation Highlights

- **Under 5.0 pounds for single-handed carry or under 10.0 pounds for two-handed carry**
- **Comfortable grasp area**
 - Room for entire hand
 - No sharp edges
- **Easy open closure**
 - High coefficient of friction closure
 - Low torque for removal
- **Easy to remove seal**



BOTTLES WITHOUT HANDLES ISSUES

Most issues are derived from two tasks: transport and dispensing. Below is a summary of the common issues with each task. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue.

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1. Transport Issues

- 1.1. The container is too heavy.
- 1.2. The container does not have a comfortable graspable area.

2. Opening Issues

- 2.1. The closure is difficult to remove.
- 2.2. The inner seal is difficult to remove.

3. Dispensing Issues

- 3.1. Dispensing places the wrist in an uncomfortable position.
- 3.2. The product must be measured as it is dispensed.

TRANSPORT ISSUES

1.1 The container is too heavy.

Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting containers that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength

Potential Solutions: *Reduce weight of the container to below 5.0 pounds.* Users may need to use two hands to carry and transport containers exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for containers that weigh more than 5.0 pounds. Heavy containers over 5.0 pounds should be designed to be carried using two hands. Multiple grasp points or a grasp point accommodating two hands can be useful when the container needs to be transported as part of the use case.

Design the shape of the grasp point to distribute the load across the inner surface area of the grasp point. Pressure points at the load-bearing portion of the grasp point can cause discomfort across painful finger joints. Consider designing the inner surface of the grasp point to distribute the load across the hand.

1.2 The container does not have a comfortable graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the container or may not know where to grasp the container if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the container without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small-radius protrusions.

Eliminate sharp edges. Sharp edges caused by incompletely milled seams or excessive flashing from a plastic part line can cause discomfort while grasping the container. Consider minimizing the seam to reduce or eliminate sharp edges.

OPENING ISSUES

2.1 The closure is difficult to remove.

Detailed Description: Large closures or closures with excessive torque requirements may be difficult to remove. Closures designed to be measuring vessels tend to be larger and may be difficult for some users with limited grip span to grasp. Measuring vessels may become slick if dispensing errors are made when dispensing, reducing the coefficient of friction of the closure.

Populations Impacted: Limited strength, limited grip, limited range of motion

Potential Solutions: *Limit the circumference of the closure.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a closure circumference that allows the adult hand to grasp the closure without exceeding a comfortable grip span.

Limit the torque required to remove the closure. Excessive torque may make it difficult or impossible for someone with arthritis to remove the closure.

Provide a high coefficient of friction closure grip. Consider using a high coefficient of friction material at the grasp point of the closure or using a knurling pattern that maximizes grip.

2.2 The inner seal is difficult to remove.

Detailed Description: Some containers feature an inner seal located at the top of the container under the closure. Users with arthritis may have difficulty removing the inner seal due to the absence of a grasp point and the amount of force required to separate the seal from the container.

Populations Impacted: Limited strength, limited grip

Potential Solutions: *Limit the amount of force required to remove the seal to 3.0 pounds or less.* Minimize the amount of force required to remove the seal. Require no more than 3.0 pounds of force to remove the seal when an adequate grasp point is provided, and the user can utilize a key pinch grip to securely grasp the grasp point.

Provide an adequate grasp point for the removal of the inner seal. Consider providing a grasp point that can be easily grasped between the thumb and knuckle using a key pinch grip. The grasp point should extend beyond the seal and be visually apparent to the user.

Do not require the use of a tool. Inner seals that require puncturing with a tool can pose a potential hazard for users with arthritis. Do not require a knife or scissors to remove the inner seal. If appropriate, reduce the amount of force required to puncture the seal to allow users to puncture it with a fingernail.

Ensure the grasp point has a sufficient coefficient of friction. Inner seal grasp points can be difficult to pinch securely without slipping. Consider the use of a texture or high coefficient of friction coating to facilitate a secure grip on the grasp point.

DISPENSING ISSUES

3.1 Dispensing places the wrist in an uncomfortable position.

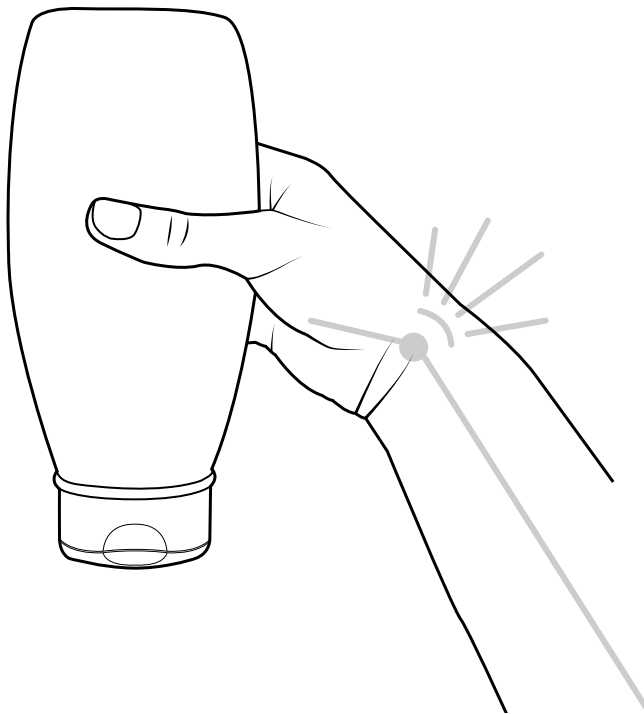
Detailed Description: The design and placement of the graspable area should consider both how the product is expected to be transported as well as how the product is dispensed from the container. The graspable area should allow the user to maintain a neutral wrist position when both transporting and dispensing the product if possible.

Populations Impacted: Limited strength, limited range of motion

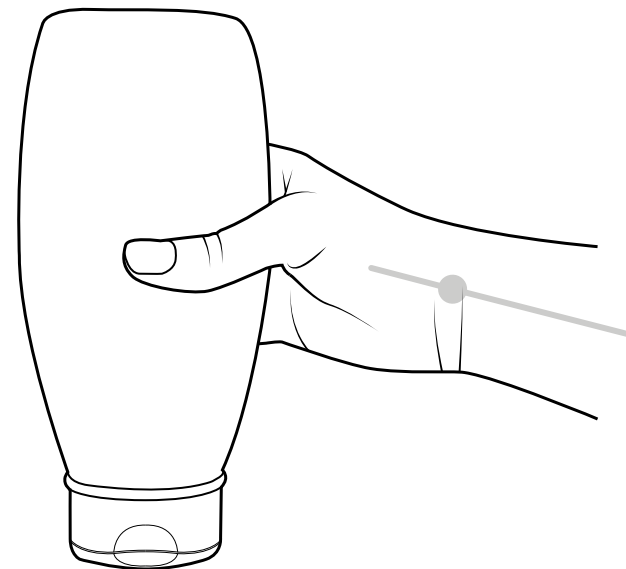
Potential Solutions: Design the product so that it can be dispensed while resting on a flat surface. Users with arthritis will find it easier to tip the container with one hand while dispensing the product into the measuring vessel with the other hand.

Place a graspable area on the side of the container when the user is expected to pour the product to dispense. A graspable area positioned on the side of the container allows the user to maintain a more neutral wrist posture while dispensing the product.

Place a secondary graspable area on the lower portion of the container. A second graspable area allows a user to use two hands to tip the container during the dispense task. A secondary graspable area may be especially useful if the container is heavy.



Uncomfortable wrist position



Comfortable wrist position

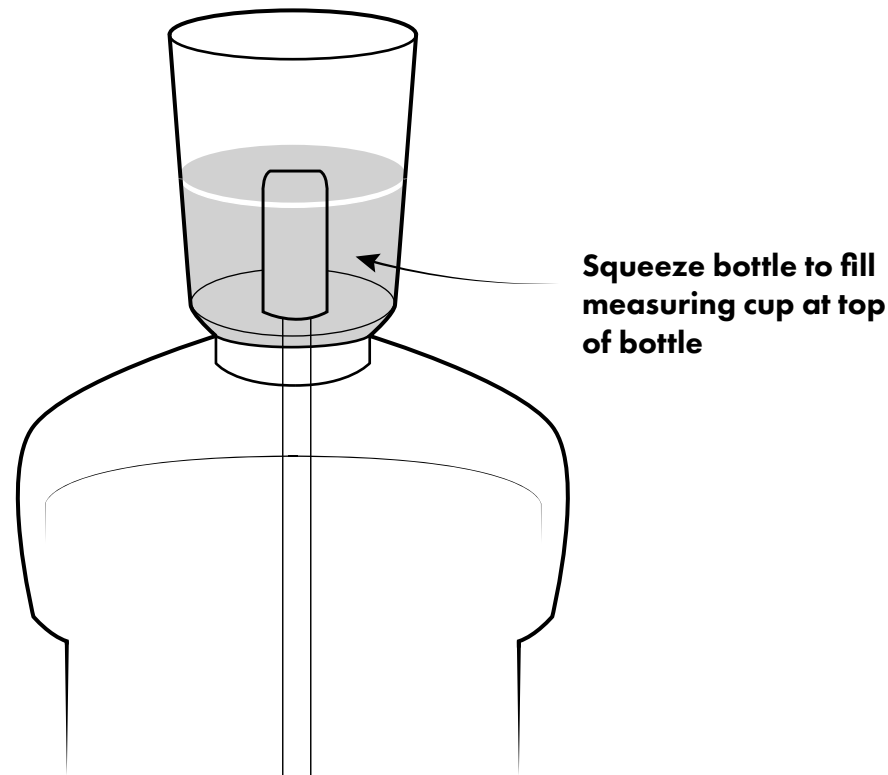
3.2 The product must be measured as it is dispensed.

Detailed Description: Products designed to be dispensed in prescribed amounts can be difficult for people with arthritis. Some products feature built-in measuring cups as part of the closure. To accurately dispense the product, users are expected to hold the container in one hand and the measuring cup in the other hand while dispensing. People with arthritis may not be able to complete the task.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Design the product so that precise measurement is not required.* Some packaging designs facilitate pre-filling the measuring device by inverting the measuring vessel while still attached to the container. Once the container is placed upright again, the measured amount of the product would remain in the measuring vessel. The user removes the measuring vessel with the product already in the vessel, avoiding the need for precise dispensing.

Design the product so that it can be dispensed while resting on a flat surface. Users with arthritis will find it easier to tip the container with one hand while dispensing the product into the measuring vessel with the other hand.



BOTTLES WITH HANDLES

Bottles with handles are a type of rigid packaging commonly used for food and beauty items and household cleaners. Examples include laundry detergent, syrup and cat litter containers. These packages are typically larger in volume and heavier than bottles without handles. Most of these packages are designed to be poured while the package is rotated. Handles are available in a variety of shapes, sizes and orientations on the package.

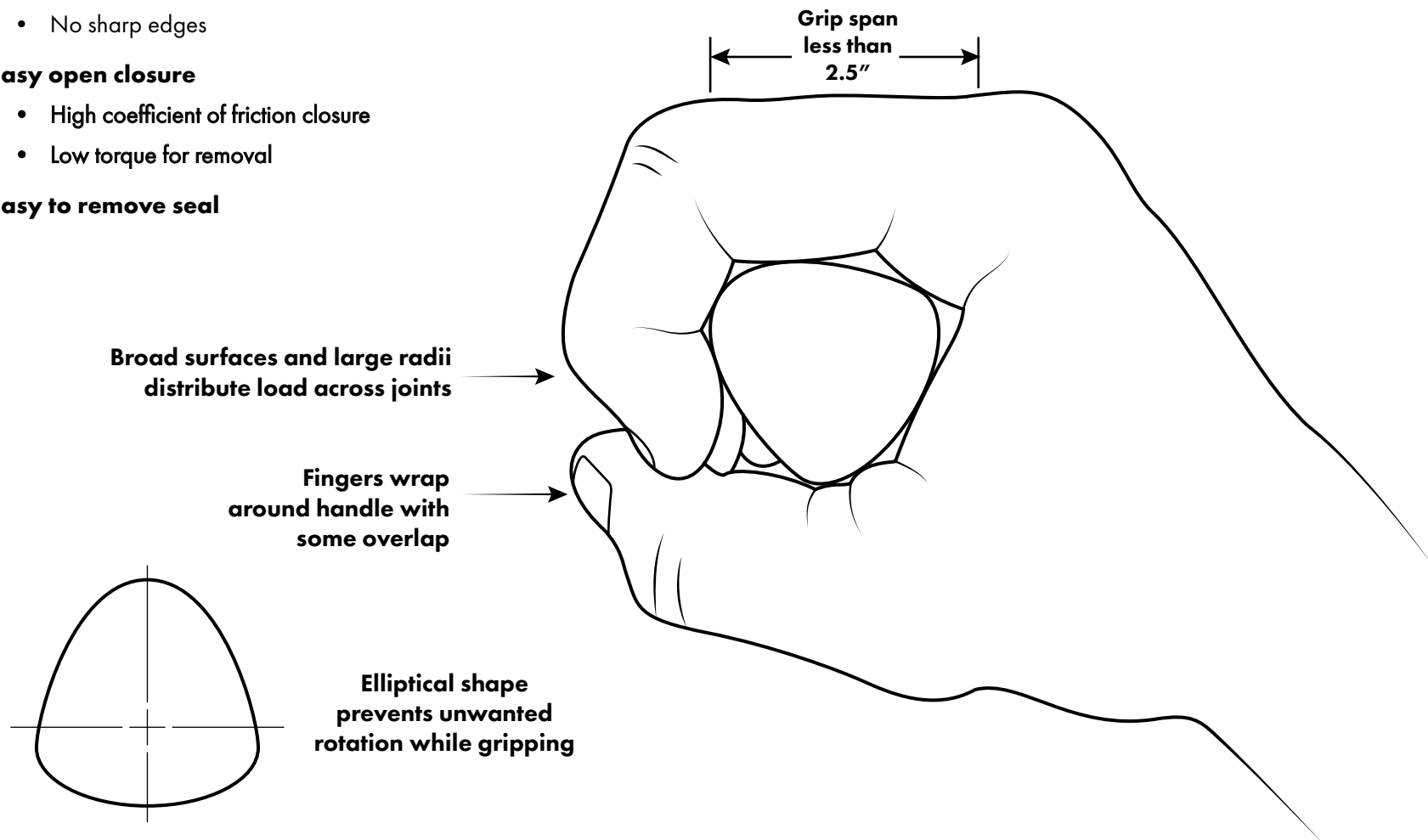
Examples of Bottles With Handles



Optimum Handle Design Guidelines

Recommendation Highlights

- **Grip span less than 2.5 inches, fingers wrap with overlap, elliptical shape, broad surfaces**
- **Under 5.0 pounds for single-handed carry or under 10.0 pounds for two-handed carry**
- **Comfortable grasp area**
 - Room for entire hand
 - Handle shaped for load distribution
 - No sharp edges
- **Easy open closure**
 - High coefficient of friction closure
 - Low torque for removal
- **Easy to remove seal**



BOTTLES WITH HANDLES ISSUES

Most issues are derived from three tasks: transport, opening and dispensing. Below is a summary of the common issues with each task. Many issues for people with arthritis stem from the weight of the product or the shape of the handle. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue.

1. Transport Issues

- 1.1. The container is too heavy.
- 1.2. The shape of the handle is uncomfortable.
- 1.3. The opening of the handle is too small.

2. Opening Issues

- 2.1. The closure is difficult to remove.
- 2.2. The inner seal is difficult to remove.

3. Dispensing Issues

- 3.1. Dispensing places the wrist in an uncomfortable position.
- 3.2. The product must be measured as it is dispensed.



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Transport Issues

1.1 The container is too heavy.

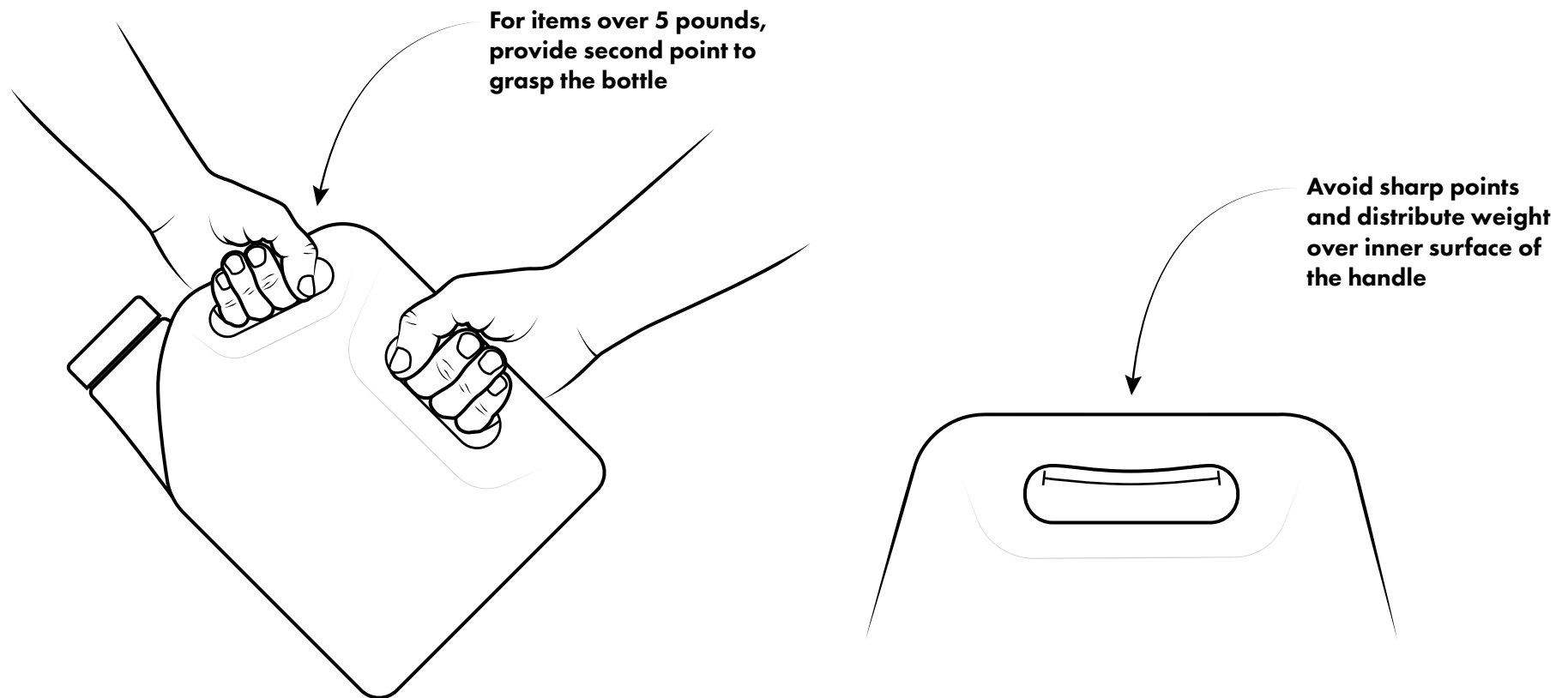
Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting containers that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength, limited grip

Potential Solutions: Reduce weight of the container for a single-handle design to below 5.0 pounds. Users may need to use two hands to carry and transport containers exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for containers that weigh more than 5.0 pounds. Heavy containers over 5.0 pounds should be designed to be carried using two hands. A grasp point built into the container in addition to the handle can be useful when the container needs to be transported as part of the use case.

Design the shape of the handle to distribute the load across the inner surface area of the handle. Pressure points at the load-bearing portion of the handle can cause discomfort across painful finger joints. Consider designing the inner surface of the handle to distribute the load across the hand.



1.2 The shape of the handle is uncomfortable.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the handle.

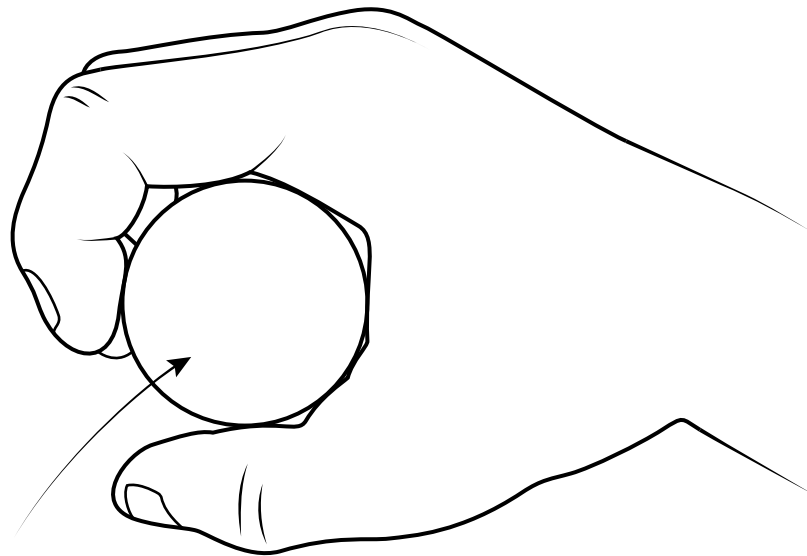
Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the circumference of the handle.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a handle circumference that allows the adult hand to completely wrap around the handle with some overlap.

Avoid small circumference handles. Handles with small circumferences can concentrate the load of the container over a small surface area of the hand. Users with painful finger joints may experience pain with small handles.

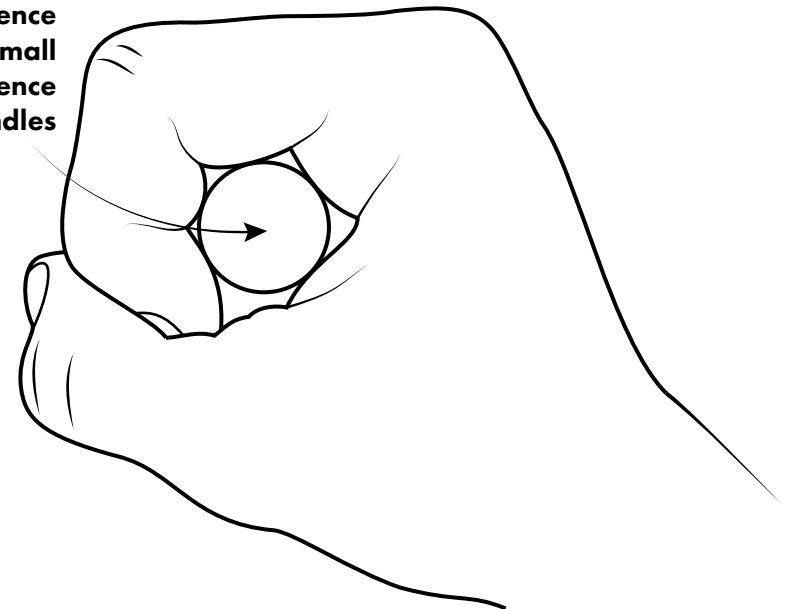
Design the shape of the handle to distribute the load across the inner surface area of the handle. Pressure points at the load-bearing portion of the handle can cause discomfort across painful finger joints. Consider designing the inner surface of the handle to distribute the load across the hand.

Eliminate sharp edges. Sharp edges caused by incompletely milled seams or excessive flashing from a plastic part line can cause discomfort while grasping the container. Consider minimizing the seam to reduce or eliminate sharp edges.



Users with arthritis may experience limited strength with excessive grip spans

Users with arthritis may experience pain with small circumference handles



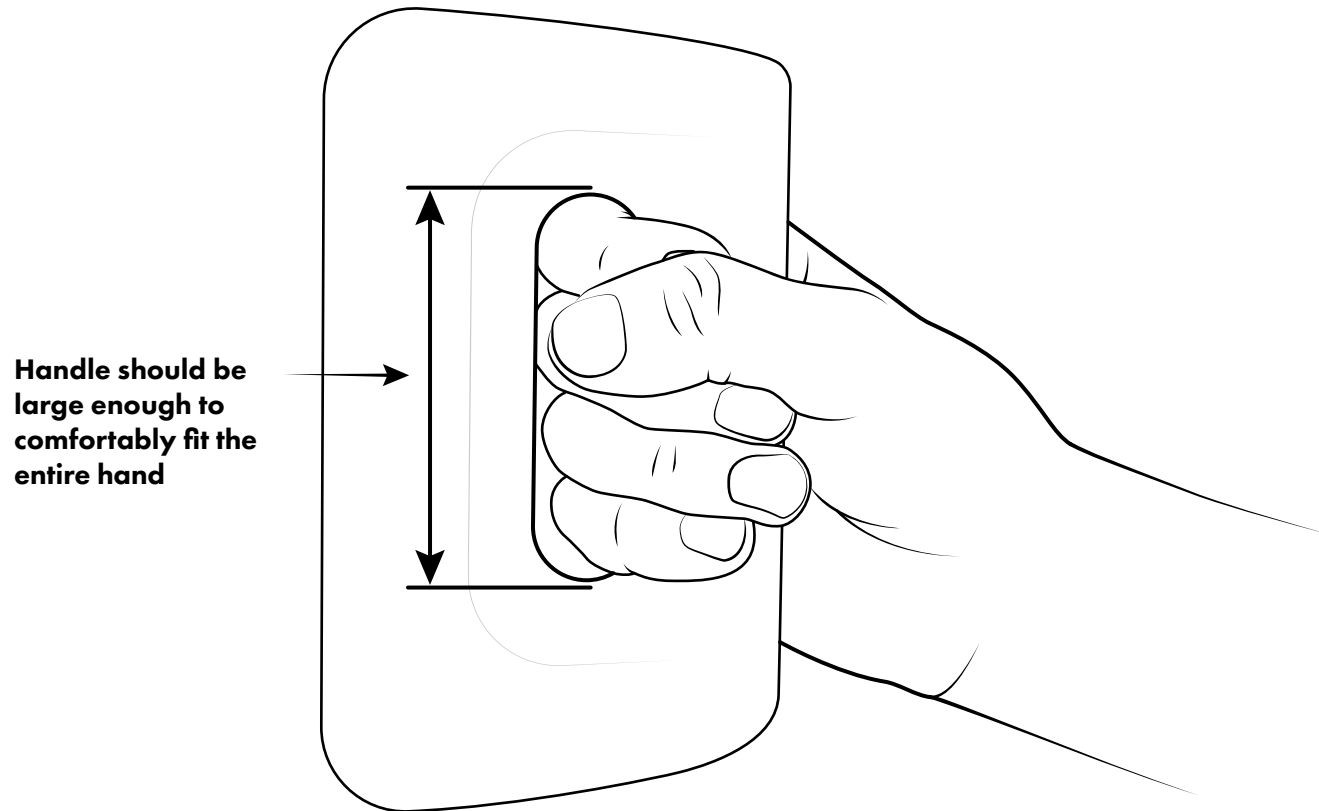
1.3 The opening of the handle is too small.

Detailed Description: Users should be able to completely insert their hands into the handle to facilitate a comfortable grasp based on their current symptoms of arthritis. Users may change their grip preferences depending on present symptoms. Handle openings of insufficient height can cause pain in the knuckles or block users from fully inserting their hands. Handle openings that are too narrow may prevent users from inserting all their fingers into the opening.

Populations Impacted: Limited range of motion, limited grip

Potential Solutions: *Avoid handle openings that are too narrow.* Handle openings that are too narrow may prevent users from fully inserting their hand into the opening.

Avoid handle openings that are not sufficiently wide. Handle openings that are not sufficiently wide may prevent users from fully inserting their hand into the opening.



Opening Issues

2.1 The closure is difficult to remove.

Detailed Description: Large closures or closures with excessive torque requirements may be difficult to remove. Closures designed to be measuring vessels tend to be larger and may be difficult for some users with limited grip span to grasp. Measuring vessels may become slick if dispensing errors are made when dispensing, reducing the coefficient of friction of the closure.

Populations Impacted: Limited strength, limited grip, limited range of motion

Potential Solutions: *Limit the circumference of the closure.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a handle circumference that allows the adult hand to completely wrap around the handle with some overlap.

Limit the torque required to remove the closure. Excessive torque may make it difficult or impossible for users with arthritis to remove the closure.

Provide a high coefficient of friction closure grip. Consider using a high coefficient of friction material at the grasp point of the closure or using a knurling pattern that maximizes grip.

2.2 The inner seal is difficult to remove.

Detailed Description: Some containers with handles feature an inner seal located at the top of the container under the closure. Users with arthritis may have difficulty removing the inner seal due to the absence of a grasp point and the amount of force required to separate the seal from the container.

Populations Impacted: Limited strength, limited grip

Potential Solutions: *Limit the amount of force required to remove the seal to 3.0 pounds or less.* Minimize the amount of force required to remove the seal. Require no more than 3.0 pounds of force to remove the seal when an adequate grasp point is provided and the user can utilize a key pinch grip to securely grasp the grasp point.

Provide an adequate grasp point for the removal of the inner seal. Consider providing a grasp point that can be easily grasped between the thumb and knuckle using a key pinch grip. The grasp point should extend beyond the seal and be visually apparent to the user.

Do not require the use of a tool. Inner seals that require puncturing with a tool can pose a potential hazard for users with arthritis. Do not require a knife or scissors to remove the inner seal. If appropriate, reduce the amount of force required to puncture the seal to allow users to puncture it with a fingernail.

Ensure the grasp point has a sufficient coefficient of friction. Inner seal grasp points can be difficult to pinch securely without slipping. Consider the use of a texture or high coefficient of friction coating to facilitate a secure grip on the grasp point.

Dispensing Issues

3.1 Dispensing places the wrist in an uncomfortable position.

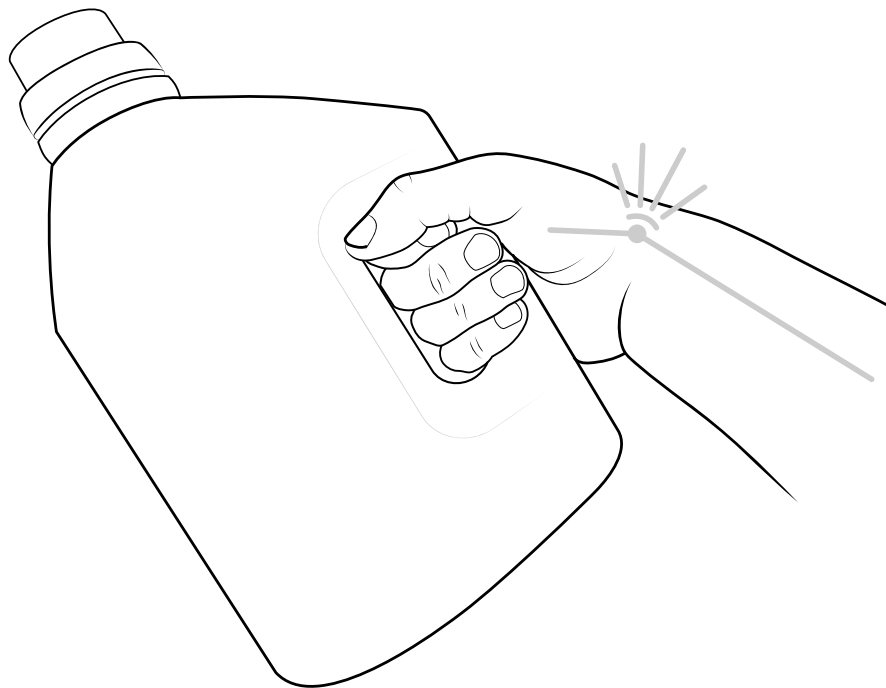
Detailed Description: A handle on the top of the container is well positioned for general transport but forces the user to rotate the wrist while dispensing the product if the product is expected to be poured. Rotating the wrist while holding a heavy container may cause pain. The design and placement of the handle should consider both how the product is expected to be transported as well as how the product is dispensed from the container. Products designed to be poured may benefit from a handle design attached to the side of the container instead of one placed on the top.

Populations Impacted: Limited strength, limited range of motion

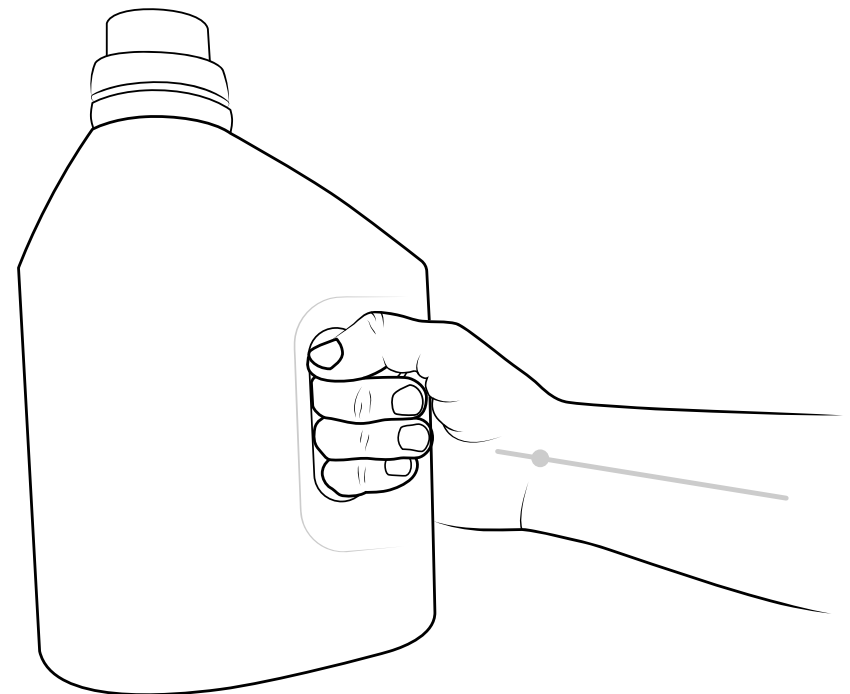
Potential Solutions: *Design the product so that it can be dispensed while resting on a flat surface.* Users with arthritis will find it easier to tip the container with one hand while dispensing the product into the measuring vessel with the other hand.

Place the handle on the side of the container when the user is expected to pour the product to dispense. A handle positioned on the side of the container allows the user to maintain a more neutral wrist posture while dispensing the product.

Place a secondary hand grip on the lower portion of the container. A second hand grip position allows a user to use two hands to tip the container during the dispense task.



Uncomfortable wrist position



Comfortable wrist position

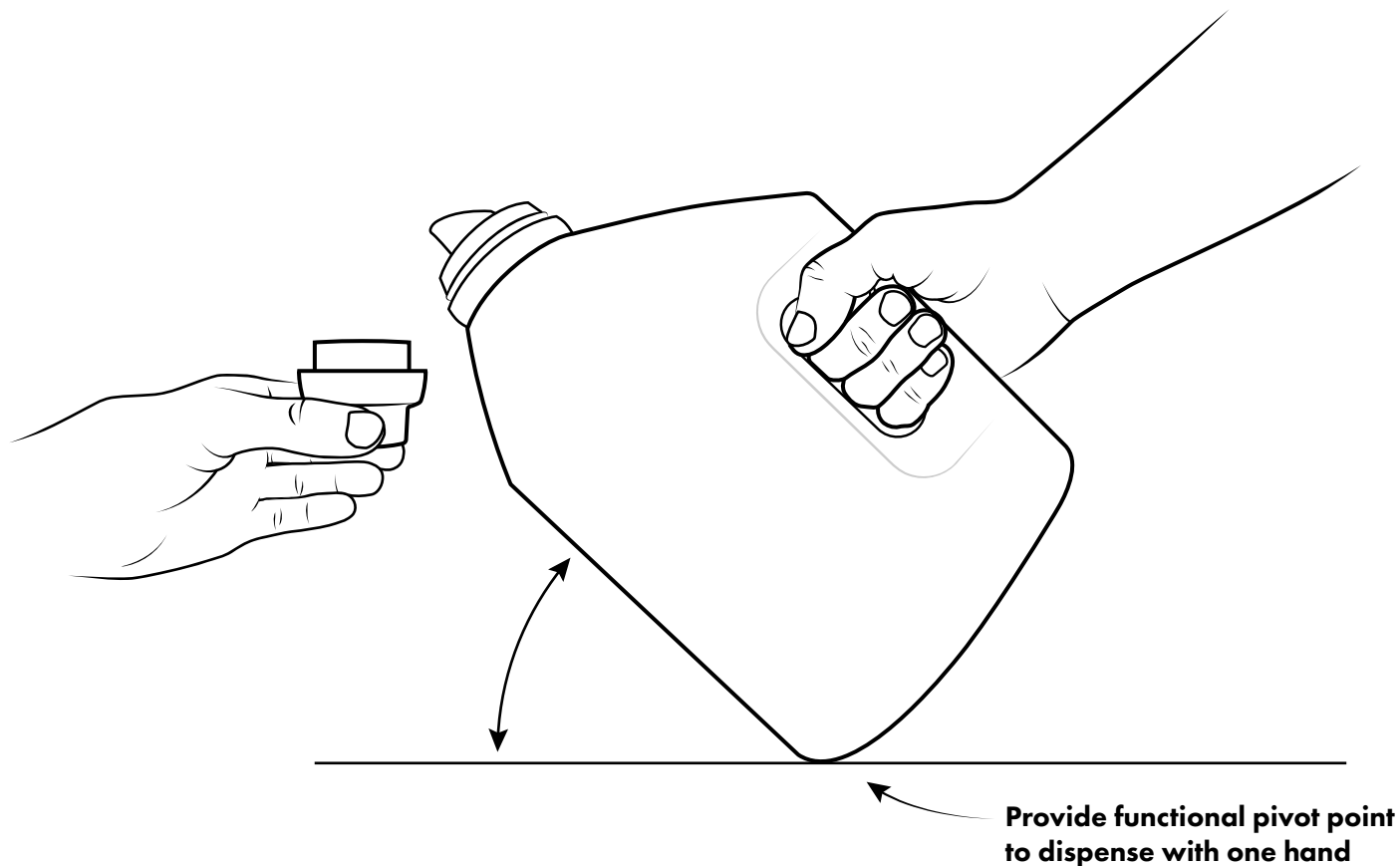
3.2 The product must be measured as it is dispensed.

Detailed Description: Products designed to be dispensed in prescribed amounts can be difficult for people with arthritis. Some products feature built-in measuring cups as part of the closure. To accurately dispense the product, users are expected to hold the container with the handle in one hand and the measuring cup in the other hand while dispensing. Users with arthritis may not be able to complete the task.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Design the product so that precise measurement is not required.* Some packaging designs facilitate pre-filling the measuring device by inverting the measuring vessel while still attached to the container. Once the container is placed upright again, a measured amount of the product would remain in the measuring vessel. The user removes the measuring vessel with the product already in the vessel, avoiding the need for precise dispensing.

Design the product so that it can be dispensed while resting on a flat surface. Users with arthritis will find it easier to tip the container with one hand while dispensing the product into the measuring vessel with the other hand.



TUBS

Tubs are a type of rigid packaging commonly found in food and beauty packaging. Examples include lemonade powder, baby food, dish soap pods, laundry pods and cleaning wipes containers. Most of these containers have a fully removeable lid, but some tubs, such as cleaning wipes, are designed with lids that dispense individual units of the product.

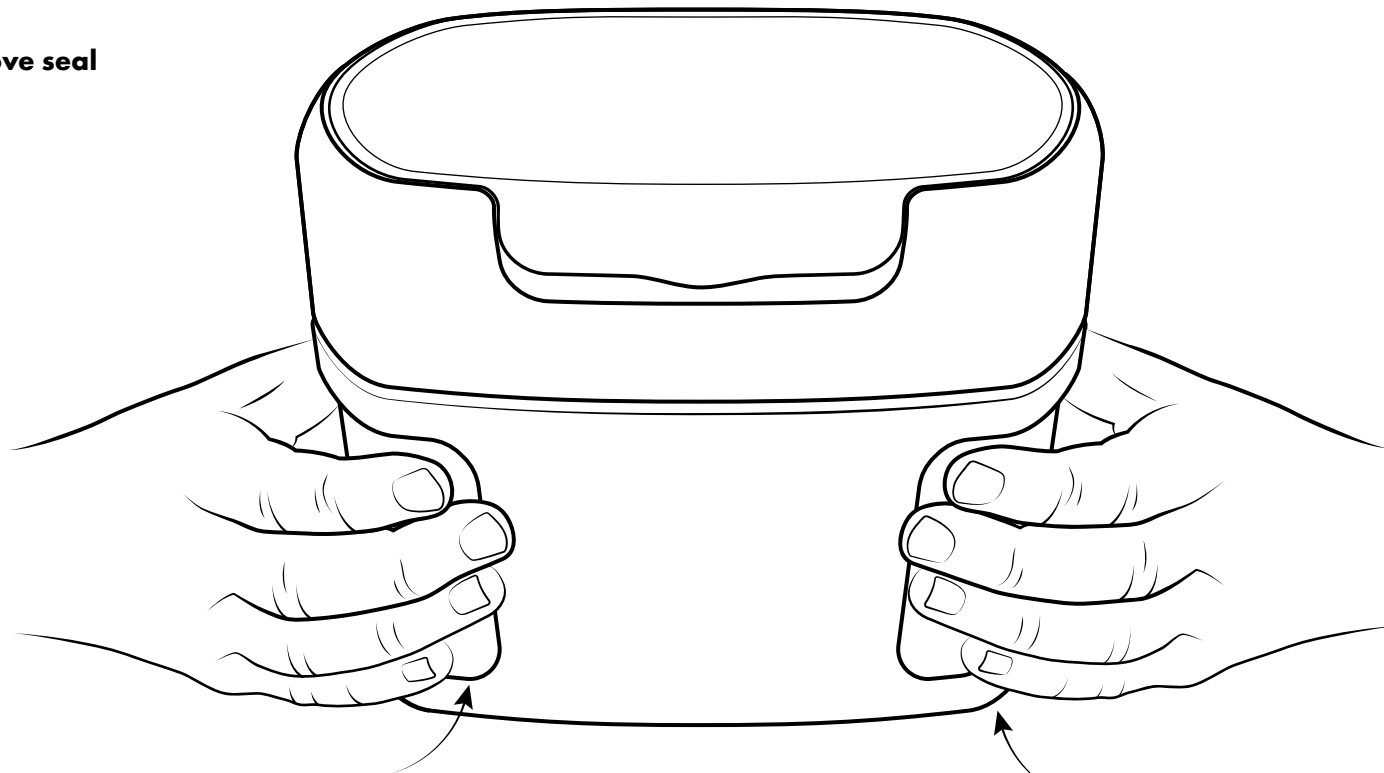
Examples of Tubs



Optimum Tub Design Guidelines

Recommendation Highlights

- **Under 5.0 pounds for single-handed carry or under 10.0 pounds for two-handed carry**
- **Comfortable grasp area**
- **Easy open lid**
 - Low force
 - No sharp edges
 - Easy to grasp
 - High coefficient of friction lid
- **Easy to remove seal**



Provide place for second hand on items weighing more than 5 pounds

Provide clear grip area for hands that does not exceed 3 inches

TUBS ISSUES

Tubs can be particularly difficult to use for people with arthritis and may require exceptional effort to increase usability. Most issues are derived from two tasks: transport and opening. Below is a summary of the common issues with each task. Many issues for people with arthritis stem from the weight of the product, the design of the grasp points or the design features used to seal the product. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue.

1. Transport Issues

- 1.1. The tub is too heavy.
- 1.2. The tub does not have a comfortable graspable area.

2. Opening Issues

- 2.1. The closure is difficult to remove.
- 2.2. The lid is difficult to remove.
- 2.3. The inner seal is difficult to remove.



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Transport Issues

1.1 The tub is too heavy.

Detailed Description: People with arthritis who experience limited strength or painful finger joints may have difficulty transporting containers that exceed 5.0 pounds for long distances. Heavier items that exceed 10.0 pounds may require a two-handed carry.

Populations Impacted: Limited strength, limited grip

Potential Solutions: *Reduce weight of the container to below 5.0 pounds.* Users may need to use two hands to carry and transport containers exceeding 5.0 pounds.

Design a second grasp point to facilitate a two-handed carry for containers that weigh more than 5.0 pounds. Heavy tubs over 5.0 pounds should be designed to be carried using two hands. A grasp point built into the tub can be useful when the tub needs to be transported as part of the use case.

1.2 The tub does not have a comfortable graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the tub or may not know where to grasp the tub if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the tub without exceeding a comfortable grip span.

Design the shape of the graspable area to distribute the load across the inner surface area of the graspable area. Pressure points at the load-bearing portion of the graspable area can cause discomfort across painful finger joints. Consider designing the graspable area to distribute the load across the hand, avoiding ridges, seams and small radius protrusions.

Eliminate sharp edges. Sharp edges caused by incompletely milled seams or excessive flashing from a plastic part line can cause discomfort while grasping the container. Consider minimizing the seam to reduce or eliminate sharp edges.

Opening Issues

2.1 The closure is difficult to remove.

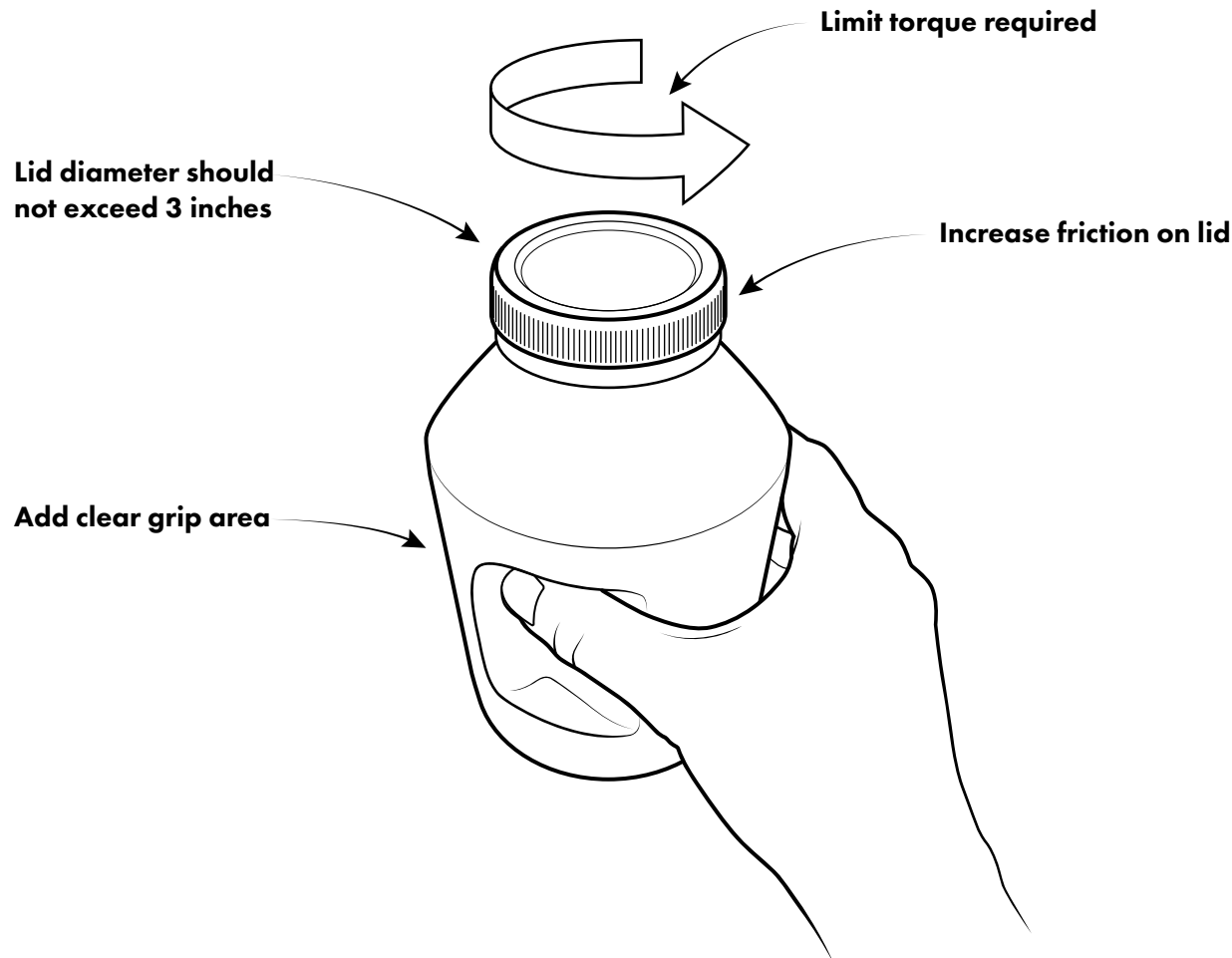
Detailed Description: Large closures or closures with excessive torque requirements may be difficult to remove.

Populations Impacted: Limited strength, limited grip, limited range of motion

Potential Solutions: *Limit the circumference of the closure.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a closure circumference that allows the adult hand to grasp the closure without exceeding a comfortable grip span.

Limit the torque required to remove the closure. Excessive torque may make it difficult or impossible for users with arthritis to remove the closure.

Provide a high coefficient of friction closure grip. Consider using a high coefficient of friction material at the grasp point of the closure or using a knurling pattern that maximizes grip.



2.2 The lid is difficult to remove.

Detailed Description: Lids are typically affixed to tubs with friction, requiring the user to pull the lid away from the tub. The side of the lid can create a pressure point and be uncomfortable for users with arthritis.

Populations Impacted: Limited strength, limited grip, limited range of motion

Potential Solutions: *Limit the amount of force required to remove the lid.* Users with arthritis can have difficulty applying enough force to the lid's lip to separate it from the tub. Consider limiting the amount of force required to lift the lid to 3.0 pounds or less.

Roll the lid lips to increase the area where users can apply force during lifting. Unrolled lid edges can be painful when applying force to lift the lid. Consider rolling the lid edge to create a larger surface area for lifting.

Design pull tabs to be easy to remove. Some tub lids feature a pull tab that is either removed or peeled from the lid before lifting the lid. The pull tab can be difficult to grasp. The force required to separate the pull tab from the lid may exceed the functional capacity of the user. Consider designing the pull tab so that it can be grasped between the thumb and side of the index finger in a key pinch. Also, consider reducing the amount of force required to separate the pull tab from the lid to below 3.0 pounds. Consider adding texture or a high coefficient of friction coating to the pull tab.

2.3 The inner seal is difficult to remove.

Detailed Description: Some tubs feature an inner seal at the top of the tub under the lid. Users with arthritis may have difficulty removing the inner seal due to the absence of a grasp point and the amount of force required to separate the seal from the tub.

Populations Impacted: Limited strength, limited grip

Potential Solutions: *Limit the amount of force required to remove the seal to 3.0 pounds or less.* Minimize the amount of force required to remove the seal. Require no more than 3.0 pounds of force to remove the seal when an adequate grasp point is provided, and the user can utilize a key pinch grip to securely grasp the grasp point.

Provide an adequate grasp point for the removal of the inner seal. Consider providing a grasp point that can be easily grasped between the thumb and knuckle using a key pinch grip. The grasp point should extend beyond the seal and be visually apparent to the user.

Do not require the use of a tool. Inner seals that require puncturing with a tool can pose a potential hazard for users with arthritis. Do not require a knife or scissors to remove the inner seal. If appropriate, reduce the amount of force required to puncture the seal to allow users to puncture it with a fingernail.

Ensure the grasp point has a sufficient coefficient of friction. Inner seal grasp points can be difficult to pinch securely without slipping. Consider the use of a texture or high coefficient of friction coating to facilitate a secure grip on the grasp point.

FIBER COMPOSITE CANS

Fiber composite cans are a type of rigid packaging commonly found in food packaging. Examples include potato chips, nuts and other snacks. They can be used for oils, vitamins and supplements as well. These packages are formed from a rolled sheet material with a permanently fixed bottom and a removeable lid. They are usually held in one hand and rotated to dispense the product.

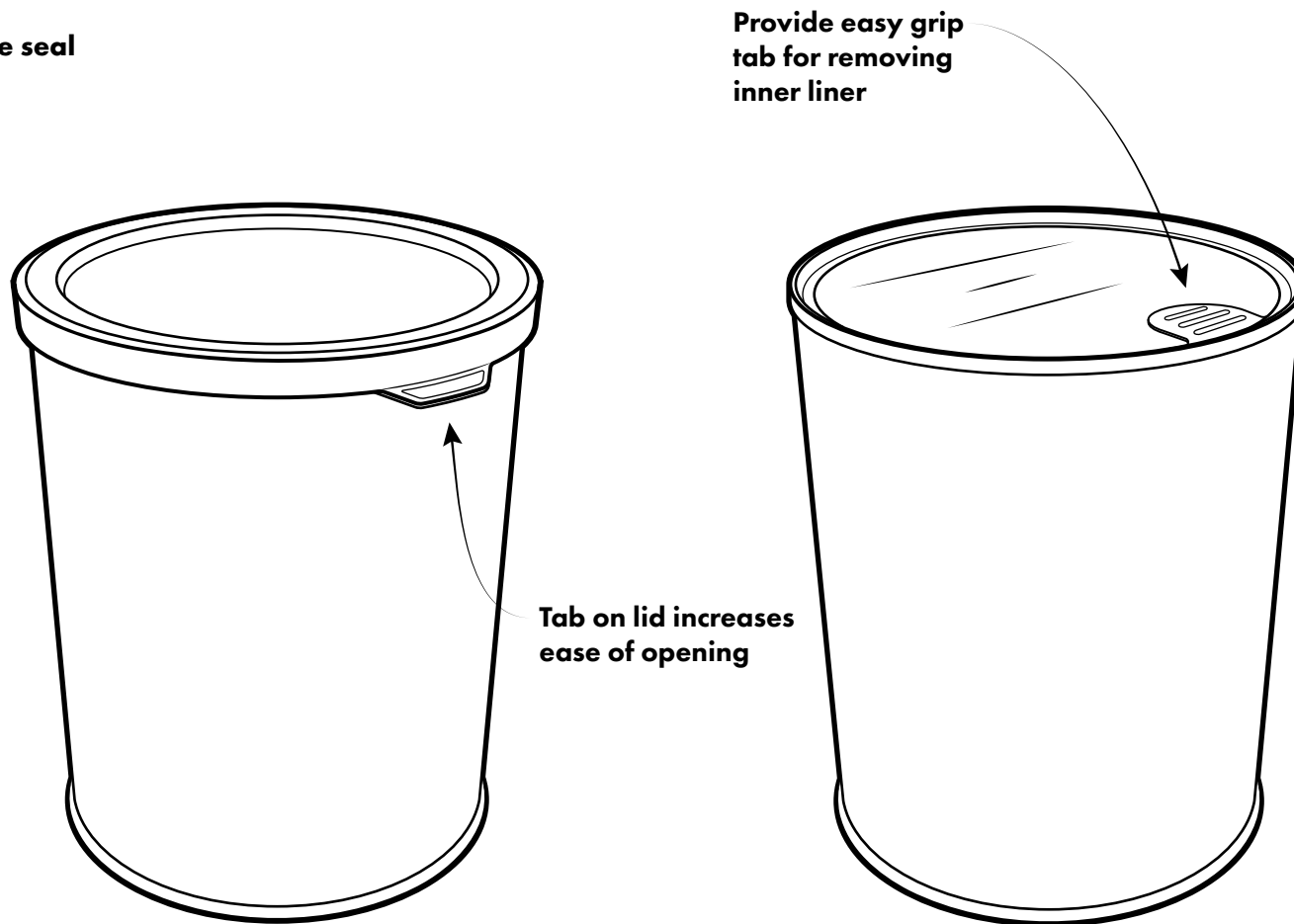
Examples of Fiber Composite Cans



Optimum Fiber Composite Cans Design Guidelines

Recommendation Highlights

- **Comfortable grasp area**
- **Easy open lid**
 - Low force
 - No sharp edges
 - Easy to grasp
- **Easy to remove seal**



FIBER COMPOSITE CANS ISSUES

Most issues are derived from three tasks: transport, opening and dispensing. Below is a summary of the common issues with each task. Many issues for people with arthritis stem from the design of the grasp point and the ability of the user to remove the closure. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue.



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1. Transport Issues

- 1.1. The container does not have a comfortable graspable area.

2. Opening Issues

- 2.1. The lid is difficult to remove.
- 2.3. The inner seal is difficult to remove.

3. Dispensing Issues

- 3.1. There are sharp edges inside the top edge.

Transport Issues

1.1 The container does not have a comfortable graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the can or may not know where to grasp the can if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the can without exceeding a comfortable grip span.

Opening Issues

2.1 The lid is difficult to remove.

Detailed Description: Lids are typically affixed to cans with friction, requiring the user to pull the lid away from the can. The side of the lid can create a pressure point and be uncomfortable for users with arthritis.

Populations Impacted: Limited strength, limited grip, limited range of motion

Potential Solutions: *Limit the amount of force required to remove the lid.* Users with arthritis can have difficulty applying enough force to the lid's lip to separate it from the can. Consider limiting the amount of force required to lift the lid to 3.0 pounds or less.

Roll the lid lips to increase the area where users can apply force during lifting. Unrolled lid edges can be painful when applying force to lift the lid. Consider rolling the lid edge to create a larger surface area for lifting.

2.2 The inner seal is difficult to remove.

Detailed Description: Some cans feature an inner seal at the top of the can under the lid. Users with arthritis may have difficulty removing the inner seal due to the absence of a grasp point and the amount of force required to separate the seal from the can.

Populations Impacted: Limited fine motor control, limited reach

Potential Solutions: *Limit the amount of force required to remove the seal to 3.0 pounds or less.* Minimize the amount of force required to remove the seal. Require no more than 3.0 pounds of force to remove the seal when an adequate grasp point is provided and the user can utilize a key pinch grip to securely grasp the grasp point.

Provide an adequate grasp point for the removal of the inner seal. Consider providing a grasp point that can be easily grasped between the thumb and knuckle using a key pinch grip. The grasp point should extend beyond the seal and be visually apparent to the user.

Do not require the use of a tool. Inner seals that require puncturing with a tool can pose a potential hazard for users with arthritis. Do not require a knife or scissors to remove the inner seal. If appropriate, reduce the amount of force required to puncture the seal to allow users to puncture it with a fingernail.

Ensure the grasp point has a sufficient coefficient of friction. Inner seal grasp points can be difficult to pinch securely without slipping. Consider the use of a texture or high coefficient of friction coating to facilitate a secure grip on the grasp point.

Dispensing Issues

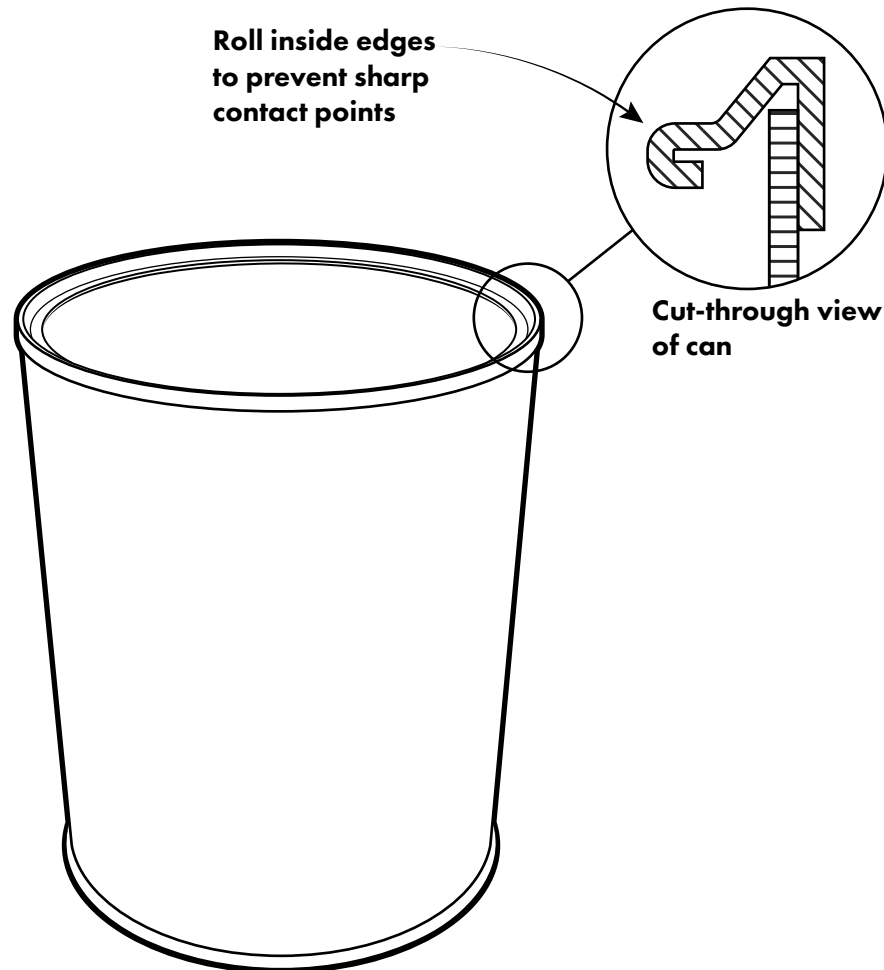
3.1 There are sharp edges inside the top edge.

Detailed Description: Some cans are terminated at the top and bottom of the can with a metal ring. The inner edge metal lip, if not rolled, can be a hazard if users insert their hand to reach the product during dispensing. Users with swollen finger joints can have difficulty navigating small aperture openings.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Roll the top metal ring inner surface.* Unrolled metal edges can be hazardous. Consider rolling the inner metal edge to increase safety when users insert their hand while accessing the product.

Provide an aperture of sufficient size for hand insertion. If users can be expected to attempt to insert their hand in the can to retrieve the product, design the can with a sufficiently sized opening to facilitate safe insertion.



JARS

Jars are a type of rigid packaging used across many segments of packaging, including food, cosmetics, personal care, home fragrance, art supplies and many other segments. Examples include pasta sauce, pickle jars, skin creams, candles and hobby paints. These packages are usually cylindrical with a twist off lid, although the material can be molded in a wide variety of forms. For smaller diameter items, such as pasta sauces, they are usually held in one hand and rotated to dispense the product. For larger- diameter applications, such as pickle jars, the lid is removed, and the contents are accessed with a utensil. For cosmetic applications, such as facial creams, the lid is removed, and the contents are accessed with fingers or a specialized brush or tool.

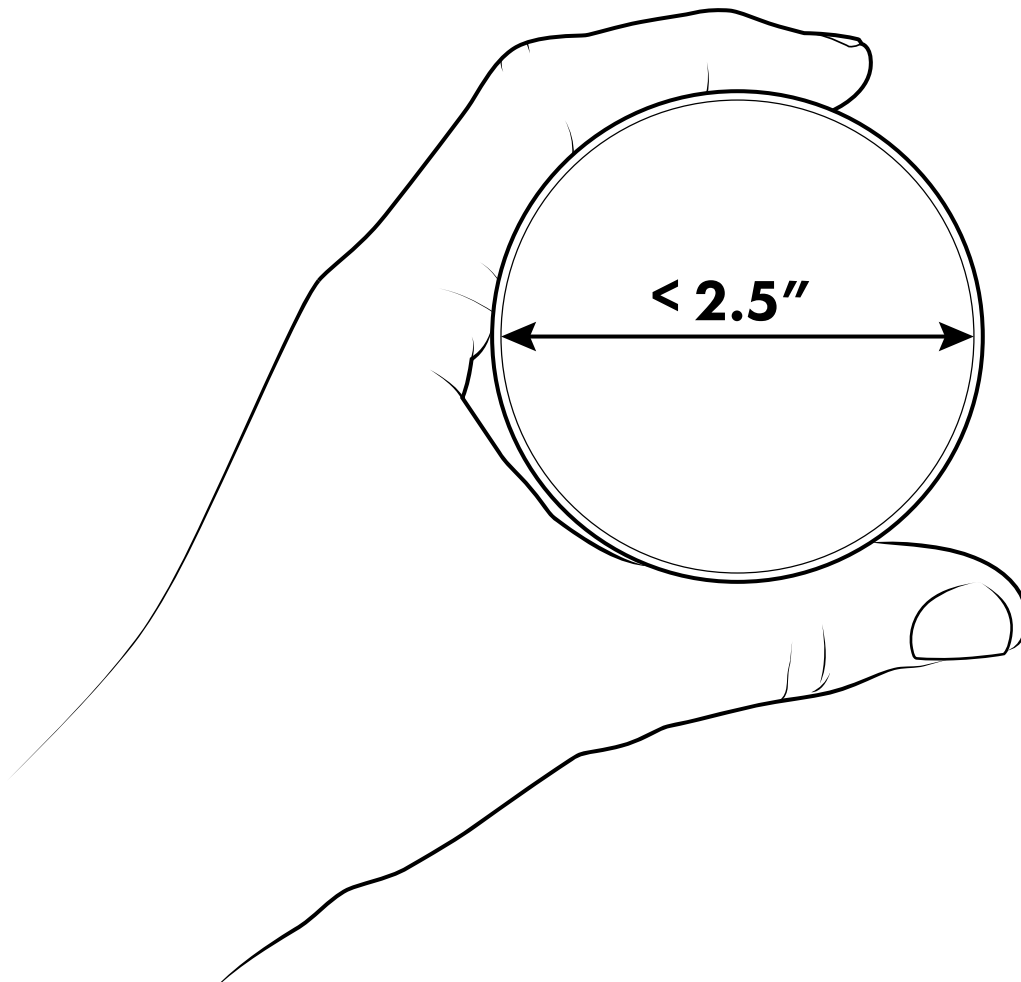
Examples of Jars



Optimum Jar Design Guidelines

Recommendation Highlights

- **Grip span under 2.5 inches for jar and lid**
- **Lid height at least thumb width**
- **High coefficient of friction closure grip**
- **Low torque for removal**
- **High coefficient of friction jar coating**



JAR ISSUES

Jars may be difficult for users with arthritis to grasp and open due to the required wide grip spans and the amount of torque required to remove closures. Glass jars, such as pickle jars, are notoriously difficult to handle and open for people with arthritis. Wide-diameter metal lids are difficult to grasp and rotate. Wide-diameter jars provide a low coefficient of friction and require excessive grip spans. Vacuum sealing the contents of the jars results in extreme torque required to open the jar for the first time. In general, those who have difficulty opening vacuum-sealed jars will ask for assistance or avoid the containers altogether. Jars that are not vacuum sealed and are of a smaller size can be easier to open. Jars with low coefficient of friction containers and metal closures can be particularly difficult to open.

1. Transport Issues

- 1.1. The container does not have a comfortable graspable area.
- 1.2. The jar may slip out of the hand during transport.

2. Opening Issues

- 2.1. The lid is difficult to remove.

3. Dispensing Issues

- 3.1. The product is difficult to remove from the jar.



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Transport Issues

1.1 The container does not have a comfortable graspable area.

Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the container or may not know where to hold the container if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the container without exceeding a comfortable grip span.

1.2 The jar may slip out of the hand during transport.

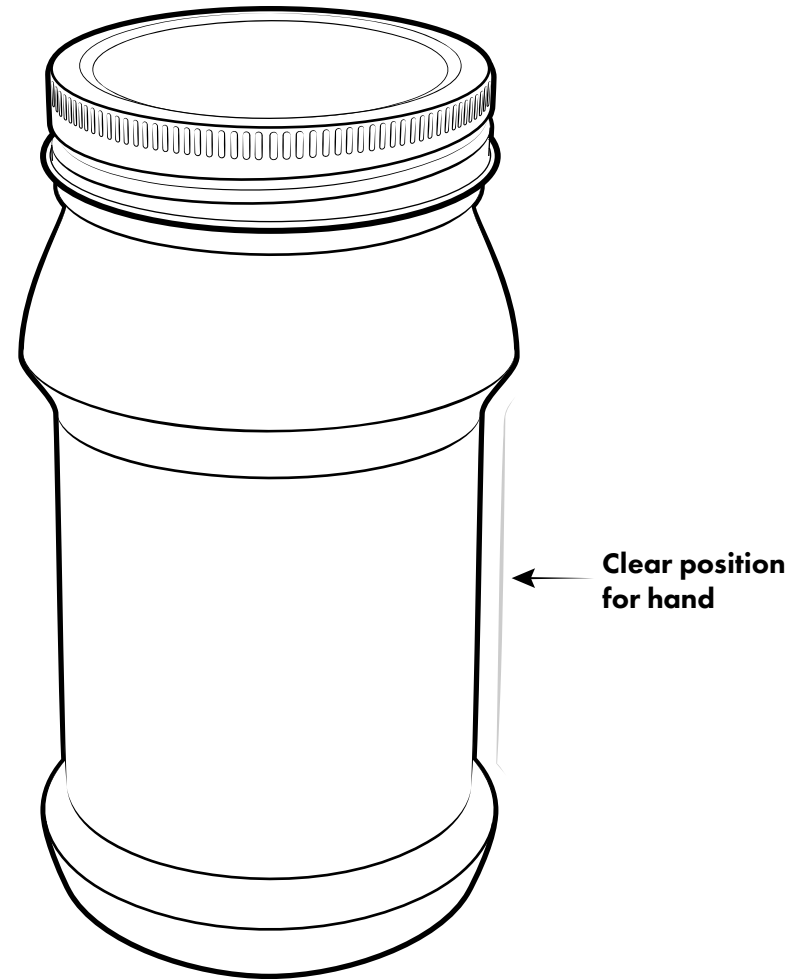
Detailed Description: People with arthritis who experience painful finger joints may have difficulty grasping the container securely. The low coefficient of friction and the cylindrical shape of the container may contribute to a user's ability to maintain a secure grip.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the container without exceeding a comfortable grip span.

Avoid tapered designs. Containers that taper with a larger base and a smaller top can be difficult to hold securely. Consider avoiding a tapered container or providing a graspable surface area outside of the tapered portion of the container.

Increase the coefficient of friction of the container. Containers with low coefficients of friction can be difficult to hold securely. Consider adding a coating or wrap that increases the coefficient of friction at the graspable area.



Opening Issues

2.1 The lid is difficult to remove.

Detailed Description: Large closures or closures with excessive torque requirements may be difficult to remove. Metal lids can be particularly difficult to grasp and remove. The maximum amount of torque that a user can comfortably apply to a closure will depend, in part, on the diameter of the closure, the height of the closure, the coefficient of friction of the graspable area of the closure, the diameter of the container, the coefficient of friction of the graspable area of the container and the texture or knurling pattern of the closure.

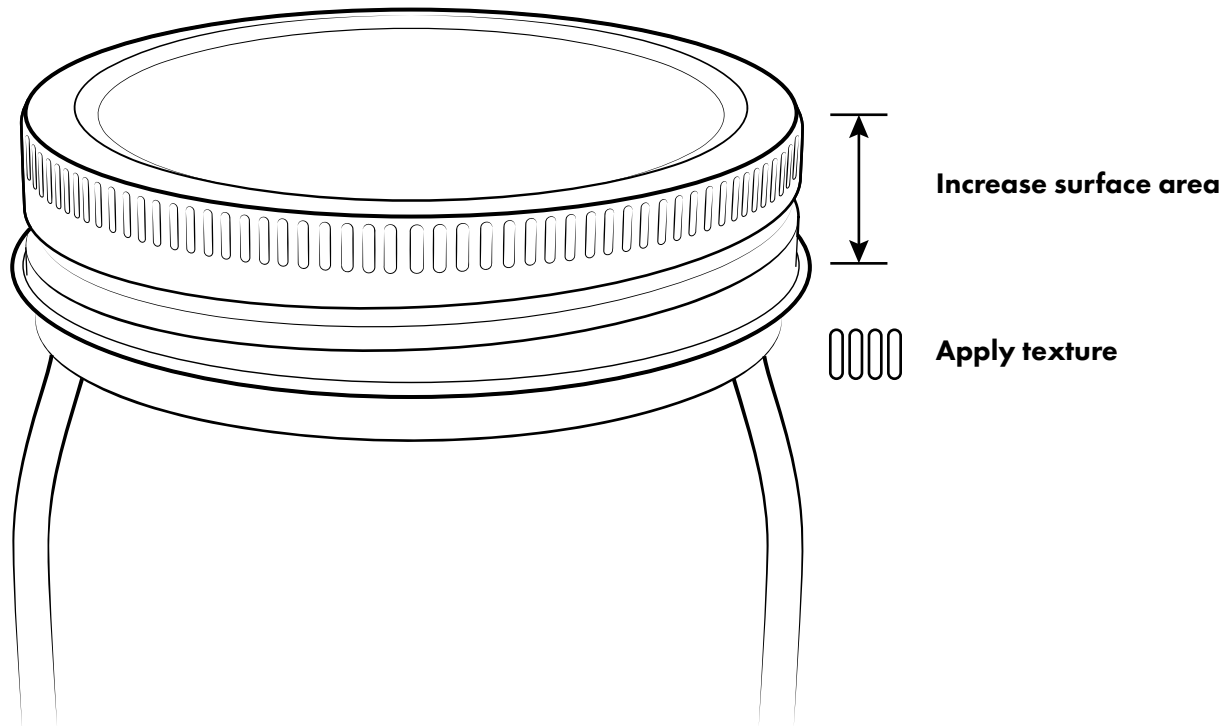
Populations Impacted: Limited strength, limited grip, limited range of motion

Potential Solutions: *Limit the circumference of the closure.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the container without exceeding a comfortable grip span.

Limit the torque required to remove the closure. Excessive torque may make it difficult or impossible for users with arthritis to remove the closure.

Provide a high coefficient of friction closure grip. Consider using a high coefficient of friction material at the grasp point of the closure or using a knurling pattern that maximizes grip.

Provide a sufficient lid height for grasping. The lid height should be at least the width of the adult thumb to support grasping the lid during removal.



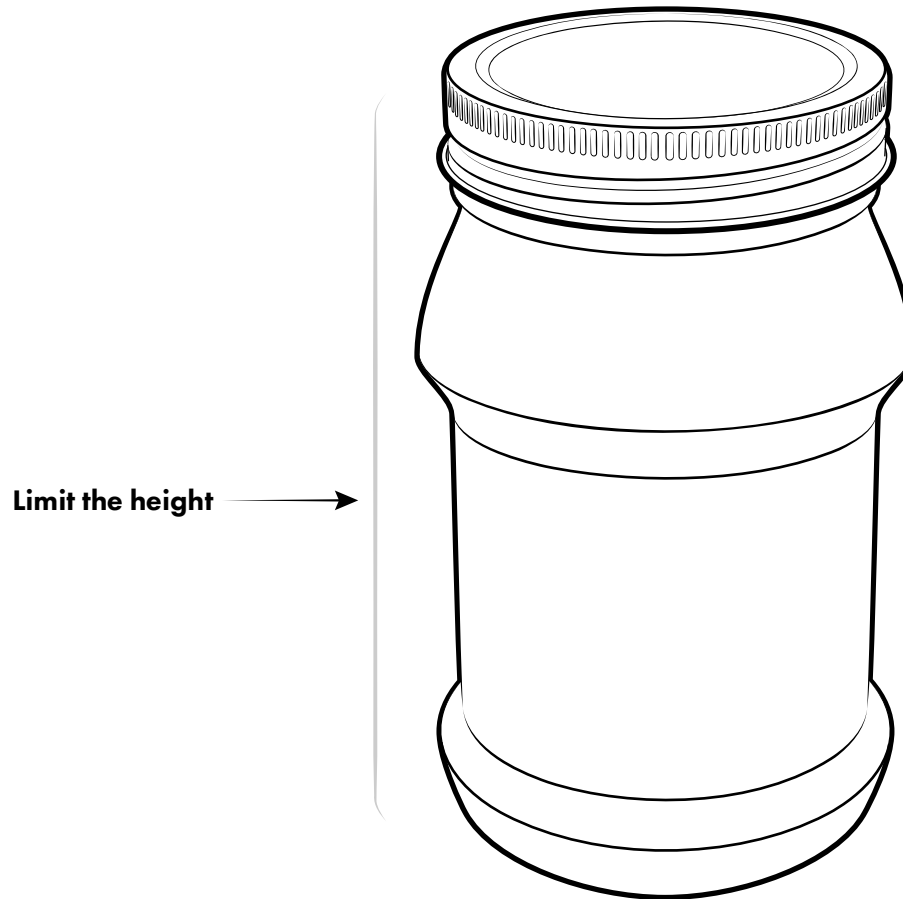
Dispensing Issues

3.1 The product is difficult to remove from the jar.

Detailed Description: Some users with arthritis may have difficulty removing products from the container due to the container's small aperture or the product's reach depth to retrieve the product inside the container. Users may need to use tools such as a fork or knife to remove the contents. Some products may have to be poured from the container, requiring the user to tilt it.

Populations Impacted: Limited strength, limited grip, limited range of motion

Potential Solutions: *Design the jar for content removal.* Users with arthritis may have trouble removing products from jars. If the product is intended to be removed using a fork or other utensil, provide an adequate opening to facilitate use of the utensil. Also, limit the jar's depth to allow the utensil to reach all its contents without causing the user to assume an uncomfortable position.



ALUMINUM CANS

Aluminum cans are a type of rigid packaging widely used in beverage and food packaging as well as household chemicals and oils. Examples include soda and beer, soup, tuna and beans in the beverage and food segment, along with machinery oils and bathroom cleaners. Aluminum cans are opened with a pull tab opening mechanism or a can opener.

Aluminum cans with spray cap closures are discussed in the components guide.

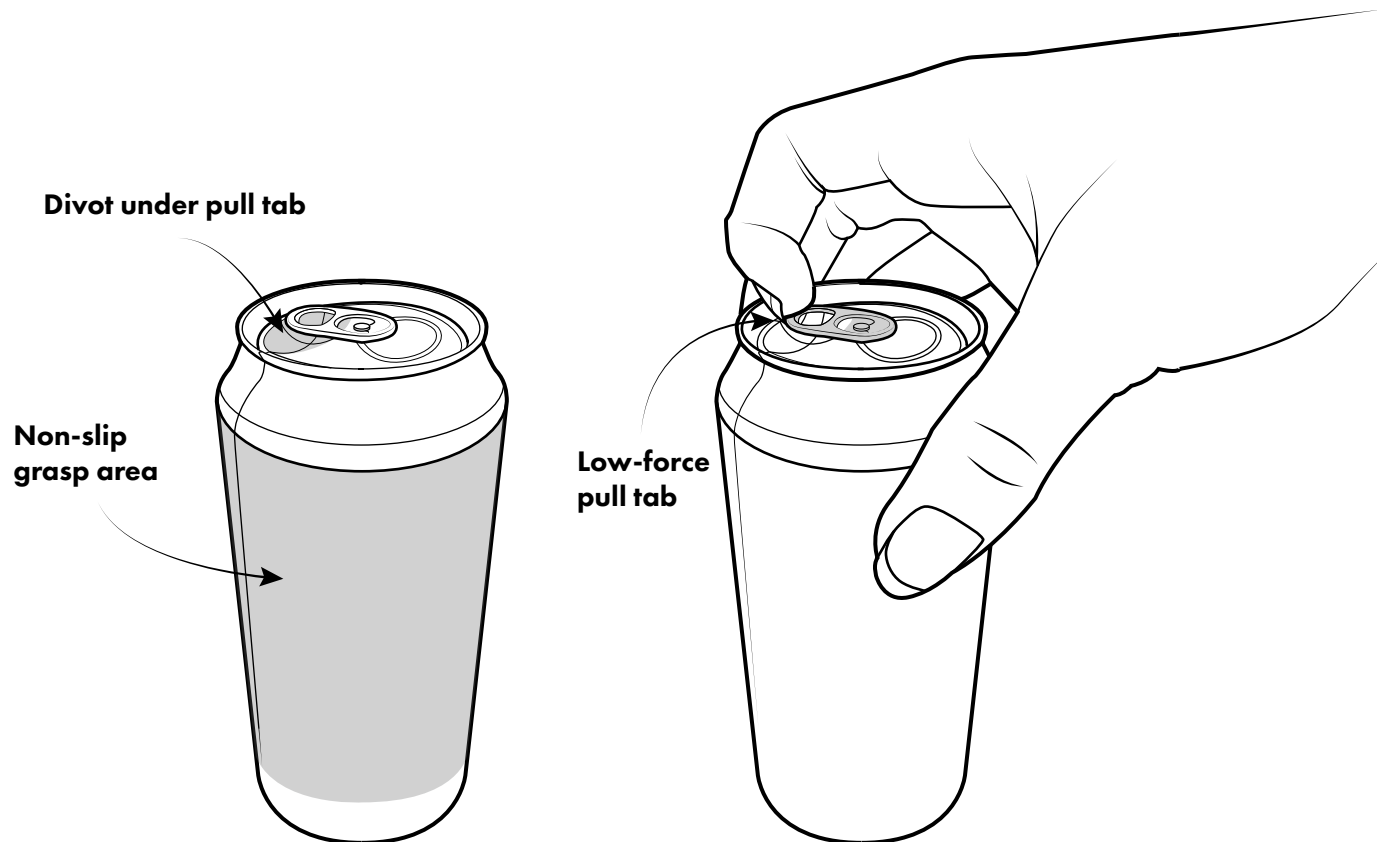
Examples of Aluminum Cans



Optimum Aluminum Can Design Guidelines

Recommendation Highlights

- **Non-slip grasp area**
- **Low-force pull tab**
- **Divot for finger under pull tab**
- **No tools required**
- **No sharp edges**



ALUMINUM CANS ISSUES

Most issues are derived from two tasks: transport and opening. Below is a summary of the common issues with each task. Many issues for people with arthritis stem from the ability of the user to securely grasp the product and the ability of the user to open the product. Cans requiring the use of a can opener can be particularly problematic for people with arthritis. Small pull tabs or pull tabs requiring excess force can also be problematic. The following pages have detailed descriptions, population impact considerations and potential solutions for each issue.

1. Transport Issues

- 1.1. The container does not have a comfortable graspable area
- 1.2. The can may slip out of the hand during transport

2. Opening Issues

- 2.1. The pull tab is difficult to actuate
- 2.2. Lids with pull tabs can be difficult to remove
- 2.3. Cans requiring an opener may be difficult to open

3. Dispensing Issues

- 3.1. There are sharp edges that may pose a hazard

Transport Issues

1.1 The container does not have a comfortable graspable area.

Detailed Description: Users with arthritis who experience painful finger joints may have difficulty grasping the container or may not know where to grasp the container if a clear graspable area is not provided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the container without exceeding a comfortable grip span.

1.2 The can may slip out of the hand during transport.

Detailed Description: Cylindrical cans with a low coefficient of friction surface may be difficult to hold.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Limit the width of the graspable area.* Users with arthritis may experience limited strength with excessive grip spans. Some users experience reductions in strength when grip spans exceed 2.5 to 3.0 inches. Select a graspable area circumference that allows the adult hand to grasp the container without exceeding a comfortable grip span.

Increase the coefficient of friction of the graspable area. Consider applying a label or coating that increases the coefficient of friction of the graspable area of the can.

Opening Issues

2.1 The pull tab is difficult to actuate.

Detailed Description: People with arthritis may find it challenging to actuate a pull tab. The tab may be difficult to grasp because the graspable area of the tab is flush mounted, or the size of the graspable area is too small. The pull tab may require too much force to lift, or the top may be difficult to separate from the container.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: Create a space between the lid and the pull tab to facilitate grasping. Users with arthritis may have difficulty obtaining sufficient leverage on the pull tab to lift it from the lid's surface. Consider creating an indentation in the lid under the graspable area of the pull tab to facilitate grasp.

Size the pull tab so that it can be easily grasped with a key pinch. The length and width of the pull tab should be sized to allow users to place the finger between the pull tab and the lid using a key pinch. The pull tab should be wide enough to distribute the force load across the surface area of the side of the index finger between the proximal finger joints.

Limit the amount of force required to lift the tab. The amount of force required to lift the pull tab, breaking the container seal, can exceed the functional abilities of people with arthritis. Consider limiting the amount of force required to lift the pull tab to less than 3.0 pounds.

2.2 Lids with pull tabs can be difficult to remove.

Detailed Description: People with arthritis may find it challenging to separate the lid from the container by pulling on the pull tab. The amount of force required to separate the lid from the container by pulling on the pull tab may exceed the functional limitations of users with arthritis.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Size the pull tab so that it can be easily grasped with a key pinch.* The length and width of the pull tab should be sized to allow users to place the finger between the pull tab and the lid using a key pinch. The pull tab should be wide enough to distribute the force load across the surface area of the side of the index finger between the proximal finger joints.

Limit the amount of force required to separate the lid from the container. Some can lids must be removed before dispensing. Consumers typically would utilize the pull tab as a handle to pull the lid from the container, avoiding the sharp edges of the inside of the lid and the lid itself. The amount of force required to separate the lid from the container can exceed the functional abilities of users with arthritis. Consider limiting the amount of force required to separate the lid from the container to less than 5.0 pounds.

2.3 Cans requiring an opener may be difficult to open.

Detailed Description: Manual can openers can be difficult to utilize. Automatic can openers may not be available or may require consumers to lift the can into place while opening. Requiring users to use a tool to access the container's contents should be avoided.

Populations Impacted: Limited strength, limited range of motion

Potential Solutions: *Do not require the use of a tool.* Cans that require using a tool can pose a potential difficulty for users with arthritis. People with arthritis may not have access to automatic can openers. Manual can openers can be difficult to use. Avoid requiring the use of any tool when possible.

Dispensing Issues

3.1 There are sharp edges that may pose a hazard.

Detailed Description: Cans with lids designed to be separated from the container may result in sharp edges upon separation. Sharp edges may pose an increased risk to users with arthritis and/or users with limited motor control.

Populations Impacted: Limited fine motor control, limited range of motion

Potential Solutions: *Avoid sharp edges.* Users with arthritis should not be required to interact with products or product components that have a sharp edge. Avoid sharp edges when possible.

Avoid sharp edges



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