

**Investigating the requirement for Ergonomic interventions and mopping alternatives for individuals suffering from endometriosis: Mini Usability Evaluation Report of the Gala**

**Twin Bucket Spin Mop**

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## Abstract

The aim of this work is to evaluate the usability of the Gala twin bucket spin mop and measure the physical impact of regular wet mopping on users suffering from endometriosis. The main points of assessment are a) the process of assembling the product for use, b) the physical strain of manual mopping on the user b) the efficiency of the product in the cleaning process with respect to COVID-19 quarantine settings. The report comprises of three segments, beginning with the introduction and literature study exploring the functioning of floor mops in general and the Gala twin bucket spin mop in particular, with emphasis on physical exertion on the user. The second part consists of the goals of the test, the procedure of the usability test conducted using the Gala twin bucket spin mop with one participant, and the corresponding findings. The last segment consists of recommendations based on the findings from the test. This formative usability test was conducted remotely using video call facility via Zoom and was conducted at the participant's home setting. During the session, the participant answered background questions, performed five tasks using the Gala mop, and ended with sum-up questions. The findings of this report are based on the participant's responses, followed by recommendations to reduce physical strain while mopping. Please note that the limited sample size restricts this report from representing a wider population.

*Keywords:* spin mop, physical strain, efficiency, functioning of floor mops, endometriosis

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## **Twin Bucket Spin Mop**

### **Introduction**

Growing frustration with ordinary cotton mops, which demanded a lot of physical strength to wring dirty water out, led Joy Mangano to develop the Miracle Mop (see *Figure 1*) in 1990. The Miracle Mop was a self-wringing, sturdy plastic mop with a head out of a continuous loop of 90 meters of cotton that could be easily wrung out without getting the user's hands wet. Within 10 years, \$10m of Miracle Mops were being sold, and when asked about the success of her products, American inventor Mangano said that "We all have similar needs, and I address them." More than two decades later, the floor mop has modified itself in more ways than one, but the intent remains the same — to address the user's needs. However, special attention must be dedicated to the needs of users who are already under some kind of physical duress.

### **Product**

The product evaluated in this study is the Gala Twin Bucket Spin Mop (see *Figure 2*). This mop set weighs 5.31 pounds and comes with 2 mop buckets (one for clean water, the other for dirty water), 1 height-adjustable stainless steel mop handle (see *Figure 3*) which rotates 180 degrees (to get to the curved corners easily), 2 microfiber mop head refills, and liquid soap dispenser. Handles for easy pick up are attached to the twin buckets which can be disassembled to be stored on top of each other to save storage space. The dirty water bucket comes with a wringer that allows users to easily press excess water out of the wet mop. One its outset, there is a water outlet plug intended to drain dirt water (see *Figure 4*) from the bucket easily. The microfiber mop is machine-washable and reusable, replacing it every 3 months is recommended

for optimal cleaning results. It is priced at \$83 on eBay, significantly more compared to Rs 1099 in amazon.in (around \$15).

### **Factors that impact this study**

#### **Impact of COVID-19 on cleaning**

Mop design modifications have helped improve cleaning efficiency since the Miracle Mop, especially during the COVID 19 pandemic where regular cleaning and sanitizing has one been the most common measures of safety recommended by experts against coronavirus and its variants. Cleanliness processes have been ramped up not only in public places like hospitals, supermarkets, but also inside homes by individuals to maintain a dirt-free hygienic environment when stuck inside due to quarantine. Many cleaning tasks demand a high cardiovascular and musculoskeletal load (Hagner & Hagberg, 1989; Krüger & Fachhochschule Hamburg, 1997; Kumar, 2006).

#### **Risk factors associated with cleaning**

Individuals who are regularly using cleaning equipment involving repetitive movements of upper extremities are now at the risk of getting affected by the same occupational diseases (e.g., musculoskeletal disorders such as neck and shoulder symptoms) that professional cleaners face (Pekkarinen, 2009) (Kumar, 2006). An ergonomic study in 2020, with a total of 48 subjects all female (see *Table 1* for characteristics of subjects), quantified and compared local muscular strain during floor mopping with seven different mopping methods (see *Table 2*). The results, measured using electromyography (EMG) and Ovako Working Posture Analysis System (OWAS), showed that the use of wet floor mopping methods was more strenuous on the muscular system than the use of dry methods (Hopsu et al., 2000). It was also observed that using adjustable handles helped participants maintain good posture while mopping (Hopsu et al.,

2000) and shoulder muscle activity was significantly lower when the handle was adjusted to shoulder or chin level, compared to eye level (Wallius et al., 2016).

### **Effects of endometriosis on household productivity**

The strain on physical health is significantly higher on women suffering from endometriosis, a disease characterized by pain symptoms. 59,411 women aged 18-49 with endometriosis were surveyed in a study that showed a significant relationship between patient-reported severity of endometriosis symptoms experienced and hours of household productivity lost (Soliman et al., 2017). This indicates an urgent need for ergonomic guidance strategies to help women manage endometriosis, and reduce productivity loss.

### **Test Procedure**

#### **Objective of the test**

The objective of the test is to a) evaluate the usability of the Gala Twin Bucket Spin Mop b) identify issues that might adversely affect user experience, especially physical health, and c) recommend future design iterations.

#### **Method**

The test session was one-on-one, 30 minutes long, documented using screenshots and hand-written notes. The test facilitator started by explaining the objective of the test, the amount of time it was expected to take, and asked for consent to taking screenshots during the test. It was explained that no identifiable information would be utilized in the report and that the participant would not be instigated to buy any product. Next, the facilitator asked the participant to position themselves with the semi-assembled product within the viewing range of the camera and spill some liquid in that area. Next, the participant was asked to complete 5 specific tasks and to describe their actions and thoughts aloud while performing these tasks. No interruptions were

made while the participant was performing these tasks, the facilitator observed and took notes. After the tasks were complete, the participant was asked some follow up questions and their responses were noted down.

### **Participant Demographic and Motivations**

The recruited participant is female, age 29 years, salaried professional working for a multinational corporation, living alone in a one-bedroom apartment in a major metropolitan city. She is a busy lady, financially well, very particular about hygiene and household maintenance. She is afflicted with endometriosis, mentioned that she has been through a major pancreatic surgery a month back and has been on recovery leave since. Since she has no house help during quarantine, she does the household cleaning regularly all by herself. She has a small house and likes to keep it clean and fragrant. Due to general long hours at work, she has very little time to get her cleaning done.

**User goals.** The user should be able to a) quickly assemble and store the mop b) use the mop to clean any liquid spillage c) clean the mop itself easily d) avoid strenuous physical pain while using the mop, and e) drain the dirty water quickly.

### **Testing**

#### **Test setup**

The test was scheduled and conducted remotely via Zoom call on a laptop, on February 9<sup>th</sup> at 10:30am EST. The participant was at their home. The participant was instructed to a) create a liquid spill on the floor and then b) perform 5 tasks while thinking out aloud.

**Tasks.** These five tasks were pre-set and aligned to the objective of the test and user goals: a) Assemble the mop b) Use the mop to clean the spill c) Clean the mop d) Adjust height of the mop e) Drain the dirty water bucket (see *Figure 5*)

## **Observations**

The participant was able to complete all 5 tasks successfully, without having to look at a user manual. It took her around 7 minutes to complete all the tasks, and she seemed very knowledgeable about the product since she uses it on a daily basis. The main issues observed were: a) She was often using her feet to manage the movement of the wringing filter (see *Figure 6*) within the bucket and also the 180-degree movement of the mop (see *Figure 7*) b) She had to manually bend and pick up the bucket to move it from one place to another (see *Figure 8*) c) During the task, the participant acknowledged that for regular cleaning, the floor had to be swept well using a broom before using the floor mop since the mop does not pick up strands of hair and thread very well.

## **Post-Task Responses**

After the tasks were completed, the facilitator asked the participants a) if there was any residual physical pain from the task. The participant indicated no pain, but indicated that a longer mopping process results in some wrist and back pain, while acknowledging that she is recovering from surgery and suffers from endometriosis. When asked b) how long she has been using this mop, the answer was more than 1 year, since the first quarantine was enforced. She decided to invest in this product as she lives alone and wanted the cleaning process to be thorough and quick. Prior to this, she has used the 'pocha' - a piece of cloth (see *Figure 9*) for floor mopping. The next question was c) why she chose to buy this product over its competitors. Several factors were mentioned like the reasonable cost of the product, the easy-storage twin bucket feature compared to single buckets available in the market, convenient dirty water drainage outlet, no need to touch and wring out the dirty mop manually, and that the microfiber mop was flexible and covered a lot of mopping area. Next, the participant d) rated the mop on a scale of 1 to 5, 5

being ‘most effective’ on 5 metrics: mobility, spot-cleaning liquid spills, floor-cleaning flexibility, wringing ease, floor-cleaning coverage. The Gala Mop’s overall score was 4.9 out of 5 (see *Table 3*).

### **Recommendations**

Based on the test findings, the recommendations are: a) The product can be customized to have wheels below the bucket, so that the set can be moved about easily. b) The lock feature placed higher up and an auto-retract feature for the mop rod after wringing, would help the user avoid bending to adjust the mop height after wringing. c) Safety and best posture practices should be included in the user manual and online tutorials to address the needs of a layman user who may not be aware of the risks. d) automating the mop and directing it to spills can improve its mobility and lay less physical stress on the user.

### **Conclusion**

From the test, we have evidence of long hours of mopping causing physical strength on users- specifically users afflicted with endometriosis. Alarmingly, studies have also found that a brand-new microfiber mop only removes 50% of surface soils and bacteria. Freshly laundered microfiber mops still contain unsterile, living bacterial levels that exceed national standards (Wienczek, 2018). Ergonomic interventions and mopping alternatives are required to help alleviate physical stress on such users. The observations and recommendations are based on the Gala Twin Bucket Spin Mop, and may not be applicable to other models or brands. The study is limited in its findings as it was conducted with only 1 participant and issues may be specific to a user’s health conditions.

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Table 1

*Characteristics of the subjects.*

*BMI= Body Mass index*

	(n=48)		
	Mean	SD	Range
Age (yrs)	43	10	20-59
Height (cm)	165	7	150-181
Mass (kg)	72	14	50-112
BMI (kg/m <sup>2</sup> )	26	5	19-39
Experience (yrs)	10	10	3-20

Table 2

*The seven different mopping methods.*

Method	Weight (dry)	Weight (water)	Amount of water (%)
Dry	171	171	0
Damp	171	282	40
Moist	171	250	59
Wet	167	430	72
Micro fibre-dry	104	104	0
Micro fibre-damp	104	184	43
Oil	266	291	9 (oil)

Table 3

*Post-task responses of participant, measuring the product against metrics provided.  
Scale 1 to 5: 1 being least effective, 5 being most effective*

Metric	Score
Mobility	4.5/5
Spot-cleaning liquid spills	5/5
Floor-cleaning flexibility	5/5
Floor-cleaning coverage	5/5
Wringing ease	5/5
<b>Overall score</b>	<b>4.9/5</b>



*Figure 1.* This is an image of the original Miracle Mop from an [infomercial](#) in 1996.



*Figure 2.* The Gala Twin Bucket Spin Mop and its disassembled parts



*Figure 3.* Adjustable handles of the Gala Twin Bucket Spin Mop



*Figure 4.* Water outlet to drain dirty water



*Figure 5. Participant performing tasks*



*Figure 6. Issue: Participant using feet to adjust mop wringer*



*Figure 7. Issue: Participant using feet to adjust mop head*



*Figure 8. Issue: Participant bending to manually move bucket*



*Figure 9.* Pocha, a traditional Indian cloth used for floor mopping; discarded, worn out clothes are often used as pocha