Case Study on Hand Washing Dishes

Department: Loughborough Design School

Module Code: DSB106

Module Title: Qualitative Methods

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Student's Degree Programme: Ergonomics (Human Factors Design)

Contents

Introduction

Washing up by hand is a process done multiple times per day by many people, and so even small savings in efficiency will add up quickly, resulting in large amounts of saved time. Of more serious concern is the possibility of pathogen transfer that may result from bad practices.

17% of reported foodborne outbreaks of infectious intestinal disease were associated with meals prepared in private residences (Cowden et al., 1995:109). Cross contamination was the third most common fault for outbreaks (Ryan *et al.,* 1996:179). Mattick *et al.* (2003) found a number of points during washing up by hand where cross-contamination can occur, and showed high potential for survival of food-borne pathogens. The combination of these demonstrate the importance of understanding the processes used when washing up by hand.

There are a few studies on washing up, particularly comparing hand-washing efficiency to machine-washing (Luecke, 1971; *Gudd et al.*, 1994; cited in Stamminger *et al.*, 2007:31). More recently, Stamminger *et al.* (2007) studied European washing up behaviour and techniques. The paper provides verbal descriptions of the behaviour of some of the participants, but does not appear to have used the methodical observational tools of a hierarchical task analysis (HTA) or a link analysis (LA). There appears to be little-to-no peer-reviewed published literature using these tools for this task.

This paper attempts to address the 2-pronged research question: what is the variation between individuals of risky subprocesses performed during washing-up by hand? And (to a lesser extent) which could be more efficient?

Methods and Results

Overview of task with HTA and LA

Participants

Given that the aim requires participants to be familiar with the same set of equipment, they were all chosen from a single residence. This purposive sampling contained elements of homogeneous sampling, in that it controlled the variables of the availability and layout of the equipment. There was also a quota sampling element, ensuring a minimum of 2 of both genders. (Robson, 2011: 274-275).

Method

For consistency's sake, the task set was to clean, dry and put away a plate, knife and fork. The water in the washing-up bowl was half-filled with luke-warm, soapy water (as if previously used) for the first participant, after which, the area would be left as it was for the next. This was to suggest how likely contamination via water would be for these participants.

A time was arranged, suitable for all participants. After they had read through the information sheet (*Appendix A*) and signed the consent form (*Appendix B*), the participants started with a plate, knife and fork (from their previous meal) set on the side. They were filmed washing up by hand, finishing when they had dried up and put away the items. If they left their items to air-dry, participants were asked to notify the researcher when they would be putting away the items.

Using the videos, HTAs were created as described by Stanton (2006). Plans were also created that show the flow of operations (Shepherd, 1998; Shepherd and Stammers, 2005). This was done for each individual HTA (*Appendix D*), and a composite encompassing the methods used (Figure 1).

A representation of the physical layout of the kitchen (see *Appendix C* for photo) including all the relevant equipment and items used (as seen from overhead)

was created using the online diagramming tool *draw.io*. A copy was created for each participants. The videos were watched more times, with a focus on the connections between items. Each time a participant moved their hands between items, or used equipment on an item (e.g. sponge on plate), a link was drawn on the appropriate LA diagram. Each time a link was repeated, its line thickness was increased and the number of times that it had been made was written over the centre of the line. An LA matrix was also created. Half of it was blacked out, so only 1 link could exist between 2 items. Each time a link was made, the number in the cell corresponding to both nodes of the link was incremented by 1. These processes were used to create each of the LAs in Appendix E. Composites were made of both representations by summing/combining the links made, creating a simple composite frequency-importance index as discussed in Sanders and McCormick (1993:462-466).

HTA Results

Figure 1: Composite HTA of 5 people washing up by hand.

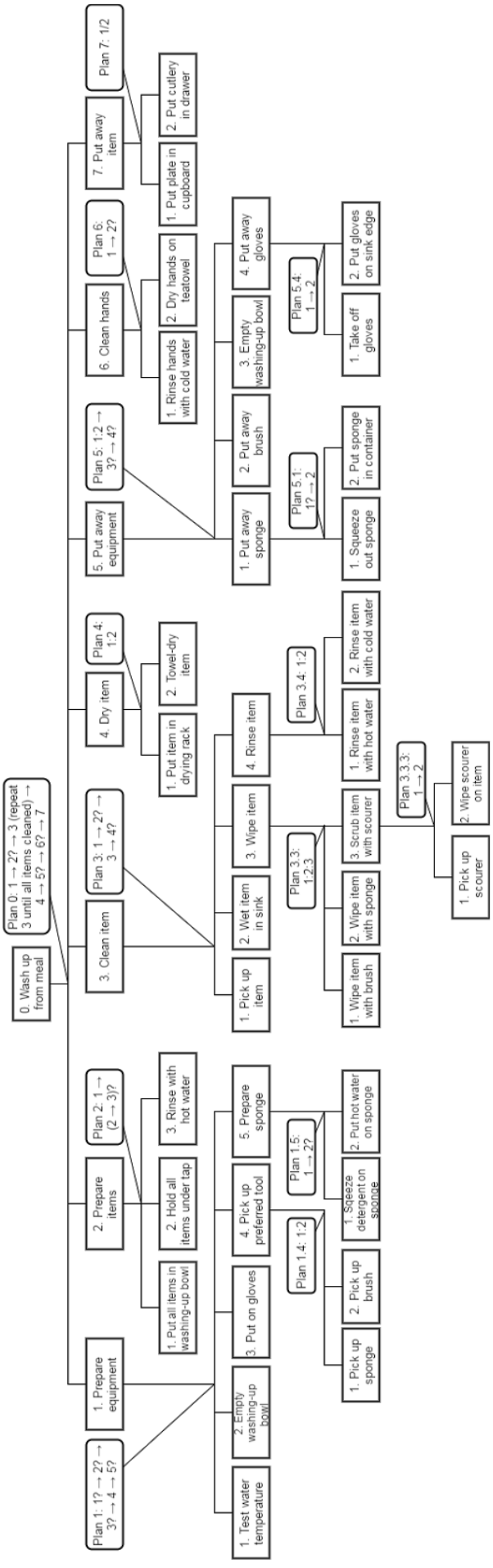


Table 1: Plan notation (modified and extended from Stanton, 2006)

Meaning	Symbol	Usage	Further explanation
then	→	1 → 2	
do in any order	/	1/2	
do any one of	:	1:2:3	
optionally do	?	1 → 2?	do 1, then optionally do 2
is *condition X* true/false	?	X? T → 1; → 2	if true, do 1 then 2, otherwise, do 2
if *condition X* is true	T	X? T → 1, F → 2; → 3	if true, do 1, then 3
if *condition X* is false	F	X? T → 1, F → 2; → 3	if false, do 2, then 3

*Table 2: Plan for c*omposite HTA of 5 people washing up from a meal by hand

Super-ordinate number	*Goal* Plan Operations	Notes
0.	*Wash up from meal* Plan 0: 1 → 2? → repeat 3 and 4 until all items cleaned and dry → 4 → 5? → 6? → repeat 7 until all items are away 1. Prepare equipment 2. Prepare items 3. Clean item 4. Dry item 5. Put away equipment 6. Clean hands 7. Put away item	7. If left to air-dry, a few hours pass after finishing the last operation before this is done.
1.	*Prepare equipment* Plan 1: 1? → 2? → 3? → 4 → using a sponge? Y → 5? 1.1. Test water temperature 1.2. Empty washing-up bowl 1.3. Put on gloves 1.4. Pick up preferred tool 1.5. Prepare sponge	

2. *Prepare items*
Plan 2: 1 → (2 → 3)?

2.1. Put all items in washing-up bowl
2.2. Hold all items under tap
2.3. Rinse with hot water

3. *Clean item*
Plan 3: 1 → 2? → 3 → 4?

3.1. Pick up item
3.2. Wet item in sink
3.3. Wipe item
3.4. Rinse item

4. *Dry item*
Plan 4: 1:2

4.1. Put item in drying rack
4.2. Towel-dry item

5. *Put away equipment*
Plan 5: 1:2 → 3? → 4?

5.1. Put away sponge
5.2. Put away brush
5.3. Empty washing-up bowl
5.4. Put away gloves

6. *Clean hands*
Plan 6: 1 → 2?

6.1. Rinse hands with cold water
6.2. Dry hands on tea-towel

7. *Put away item*
Plan 7: 1/2

7.1. Put plate in cupboard
7.2. Put cutlery in drawer

1.4. *Pick up preferred tool*
Plan 1.4: 1:2

1.4.1. Pick up sponge
1.4.2. Pick up brush

1.5. *Prepare sponge*
Plan 1.5: 1 → 2?

1.4.3. Pick up sponge
1.4.4. Pick up brush

3.3. *Wipe item*
Plan 3.3: 1:2:3

- 3.3.1. Wipe item with brush
- 3.3.2. Wipe item with sponge
- 3.3.3. Scrub item with scourer

3.4. *Rinse item*
Plan 3.4: 1:2

- 3.4.1. Rinse item with hot water
- 3.4.2. Rinse item with cold water

3.3.3. *Scrub item with scourer*
Plan 3.3.3: 1 → 2

- 3.3.3.1. Pick up scourer
- 3.3.3.2. Wipe item with scourer

5.1. *Put away sponge*
Plan 5.1: 1? → 2

- 5.1.1. Squeeze out sponge
- 5.1.2. Put sponge in container

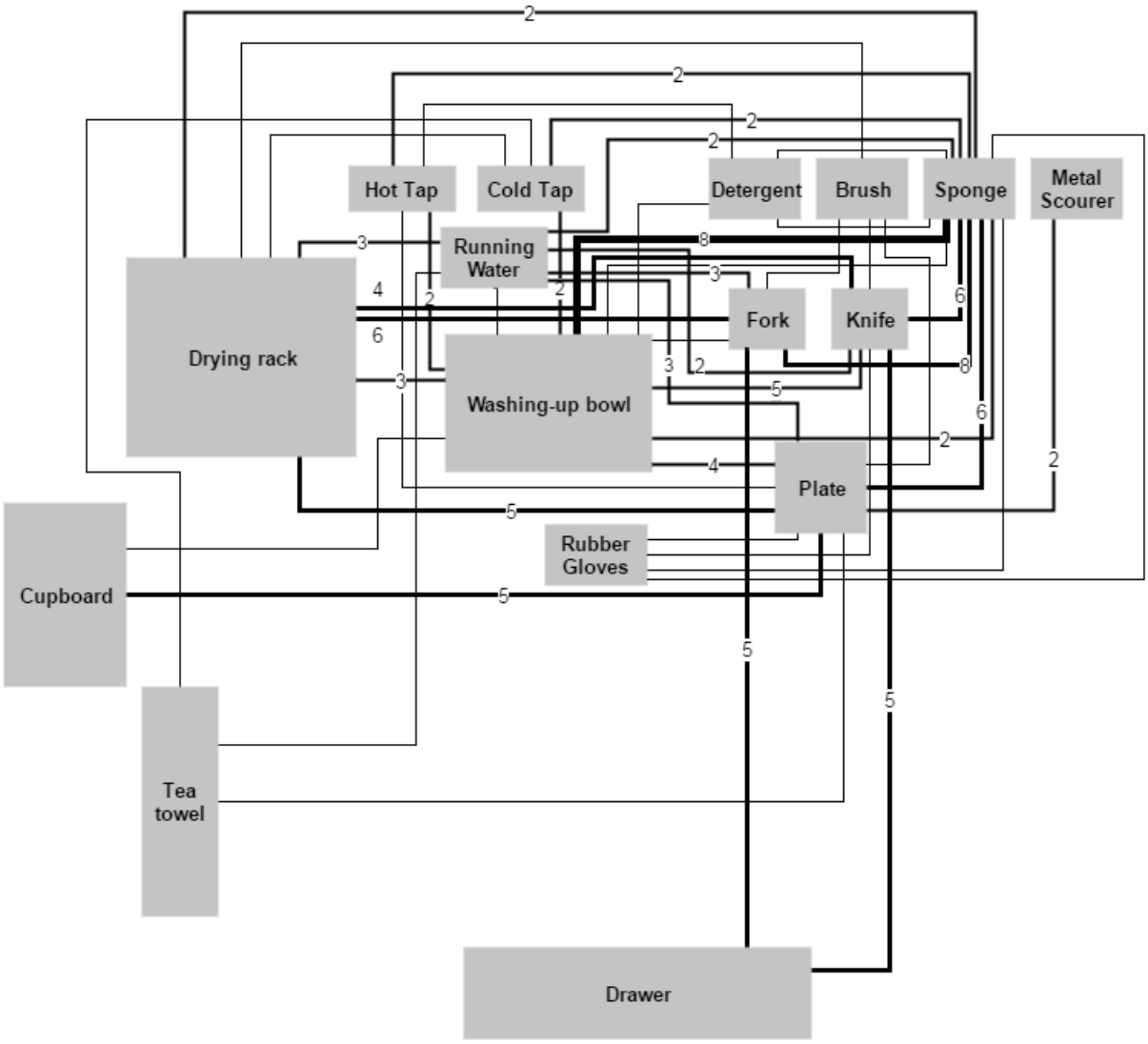
5.4. *Put away gloves*
Plan 5.4: 1 → 2

- 7.1. Take off gloves
- 7.2. Put gloves on sink edge

As shown in Figure 1 and Table 2, the goal of washing up by hand has been achieved by 7 major operations: Prepare equipment, Prepare items, Clean item, Dry item, Put away equipment, Clean hands, Put away item. No participants performed all of these actions, for instance, only one dried their hands on the tea-towel. Air drying was more popular than towel-drying. The sponge was used more than the other two available cleaning equipment. Only 2 of 5 people used additional detergent - the others used whatever was left in the washing-up bowl (which at no point was very soapy).

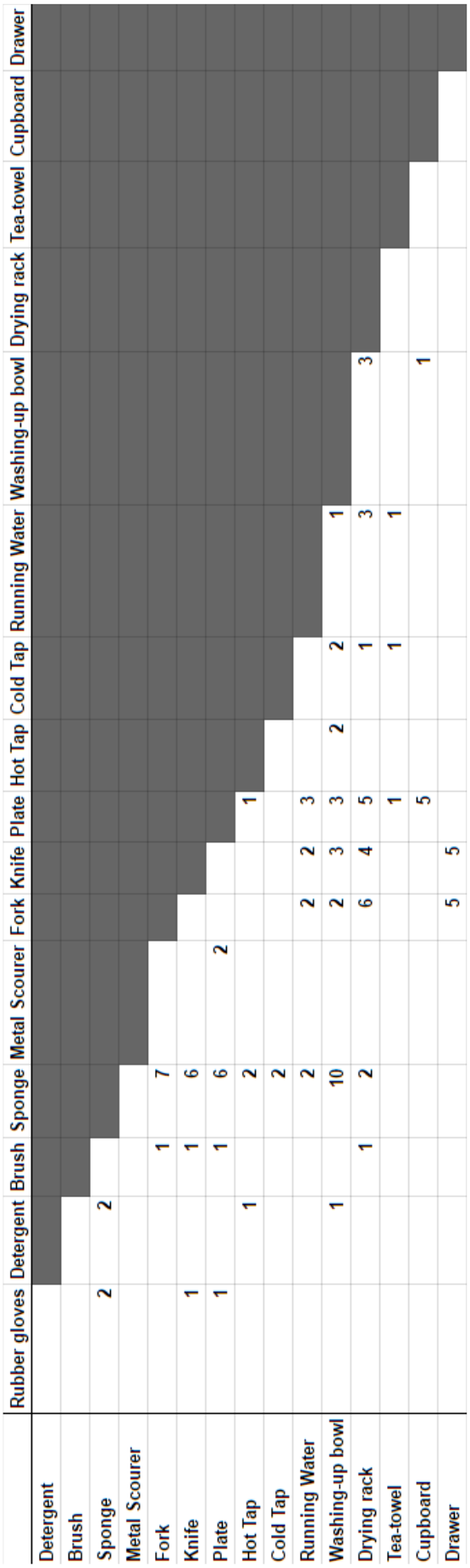
LA Results

Figure 2: Composite link analysis of 5 participants washing up by hand



The composite image (Figure 2) gives a visual impression of where most movements were made, but as there are so many links, it is difficult to make out detail. There appears to be a high concentration of links with the sponge, the running water, the drying rack and the washing-up bowl. Table 2 provides the numerical additions of each link.

Table 2: Composite Link analysis matrix of 5 people washing up by hand.



	Rubber gloves	Detergent	Brush	Sponge	Metal Scourer	Fork	Knife	Plate	Hot Tap	Cold Tap	Running Water	Washing-up bowl	Drying rack	Tea-towel	Cupboard	Drawer
Detergent																
Brush																
Sponge	2	2														
Metal Scourer																
Fork			1	7												
Knife	1		1	6												
Plate	1		1	6	2											
Hot Tap		1		2				1								
Cold Tap				2												
Running Water				2		2	2	3								
Washing-up bowl		1		10		2	3	3	2		2	1				
Drying rack			1	2		6	4	5			1	3				
Tea-towel								1			1	1				
Cupboard								5					1			
Drawer						5	5									

Frequently-made links (>5; more than once per person) were:

- Sponge -- fork
- Sponge -- knife
- Sponge -- plate
- Sponge -- washing-up bowl (skewed by 1 participant with 8 links)
- Drying-rack -- fork

The sponge links are not unexpected - the most common tool being used to clean each item. The number of drying-rack -- fork links may suggest that this is a place where efficiency can be improved.

Overall, efficiency due to item location seemed quite high: there are not many links on the LA that could be made much shorter without compromising functionality in some way. The cutlery drawer is an exception, which would be faster to access if it were closer. In terms of procedure, redundant links were created by one user who moved items to the washing-up bowl one-at-a-time.

Questionnaire

Method

Questions were created in order to triangulate results from the HTA and LA and to discover more information on the scale of hazardous practices. The questionnaire (see *Appendix F*) was created on SurveyMonkey, which allows only 10 questions. Justification for the questions follows:

1-2. Basic demographic information (gender and age range) can identify trends in who might be better targeted for improving their habits.

3, 6. The likelihood of contagion and importance of efficiency are both dependent on the frequency with which people wash up by hand and the number of items they wash.

4. 2 of 5 observation participants used rubber gloves, this may affect efficiency as either an extra step, or faster cleaning, as hotter water can be used.

5, 10. 1 of 5 observation participants towel-dried a plate. Mattick *et al.* (2003:213) found that "after towel-drying the cloth became contaminated on every occasion, regardless of the test organism". 4 of 5 observation participants used a sponge, which Mattick et al. (2003:213) found "frequently became contaminated with pathogens". It was important to discover how commonly these, and other washing equipment, are used in a larger sample.

8, 9. To determine how long pathogens would have the opportunity to contaminate washing up, it was necessary to see how long their living environments would be used before being replaced.

7. Only 1 of 5 observation participants emptied the washing-up bowl before using it, despite the previous users. Mattick *et al.* (2003:213) found that "A proportion of sterile dishes washed after contaminated dishes became contaminated with pathogens but transfer from dishes onto food was rare", and given that transfer "from dishes onto food" may not generalise very well, it was important to see what would prompt people to empty the bowl.

More questions could have covered: frequency of detergent use and of hand-drying on tea-towels.

A pilot of the questionnaire was run with 4 participants. The feedback from this led to making the wording more explicit, e.g. appending "(Please enter a number of times in the range 1-100)" for those who would put in words where numbers were needed.

The questionnaire was distributed via a convenience sampling method by sharing the link on Facebook. The potential respondents (the author's 'friends' on Facebook) were 829 in number, and are primarily in the age range 18-35, with close to an even split on gender lines. Compared to Great Britain at large (Nomis, 2016), there is a bias towards people who have been to, or currently are at, university.

The major trade-off of this sampling procedure is less demographic knowledge of the sample, but faster, and more, responses .

Results

With an original target of 20 respondents, there were 40 within 12 hours of posting the survey, at which point access to the online questionnaire was stopped.

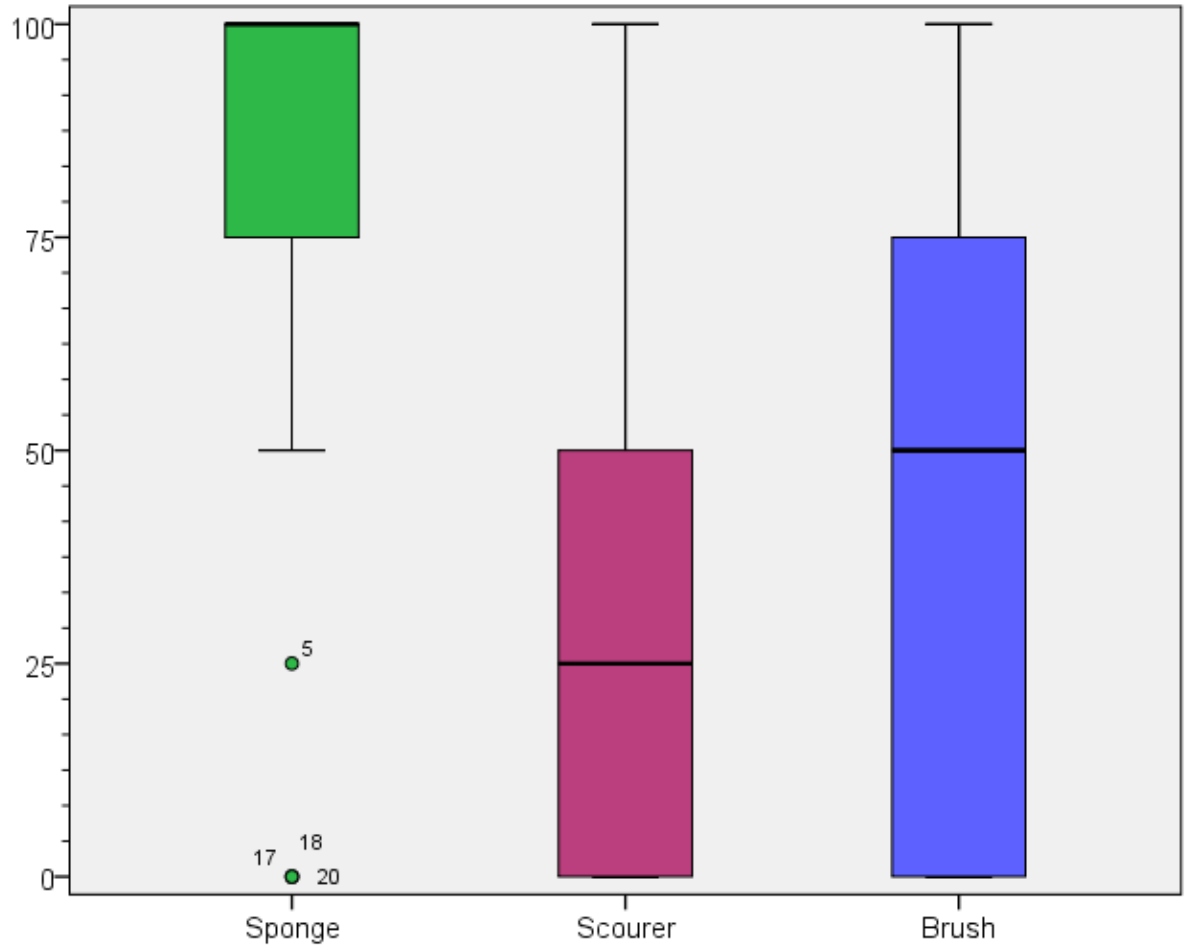
Of the 40 respondents, 20 were female, 19 were male, and 1 reported ‘other/prefer not to say’. 36 were in the age range 18-25, 3 were 25-35 and 1 preferred not to say. The mean and standard deviation of the scalar variables are presented in Table 3.

Unexpectedly, multiple participants reported 100 weekly occasions hand washing, with 25 or more items per time. This may be job-related. Rubber glove use was 7.5%.

Table 3: Descriptive statistics of washing-up habits

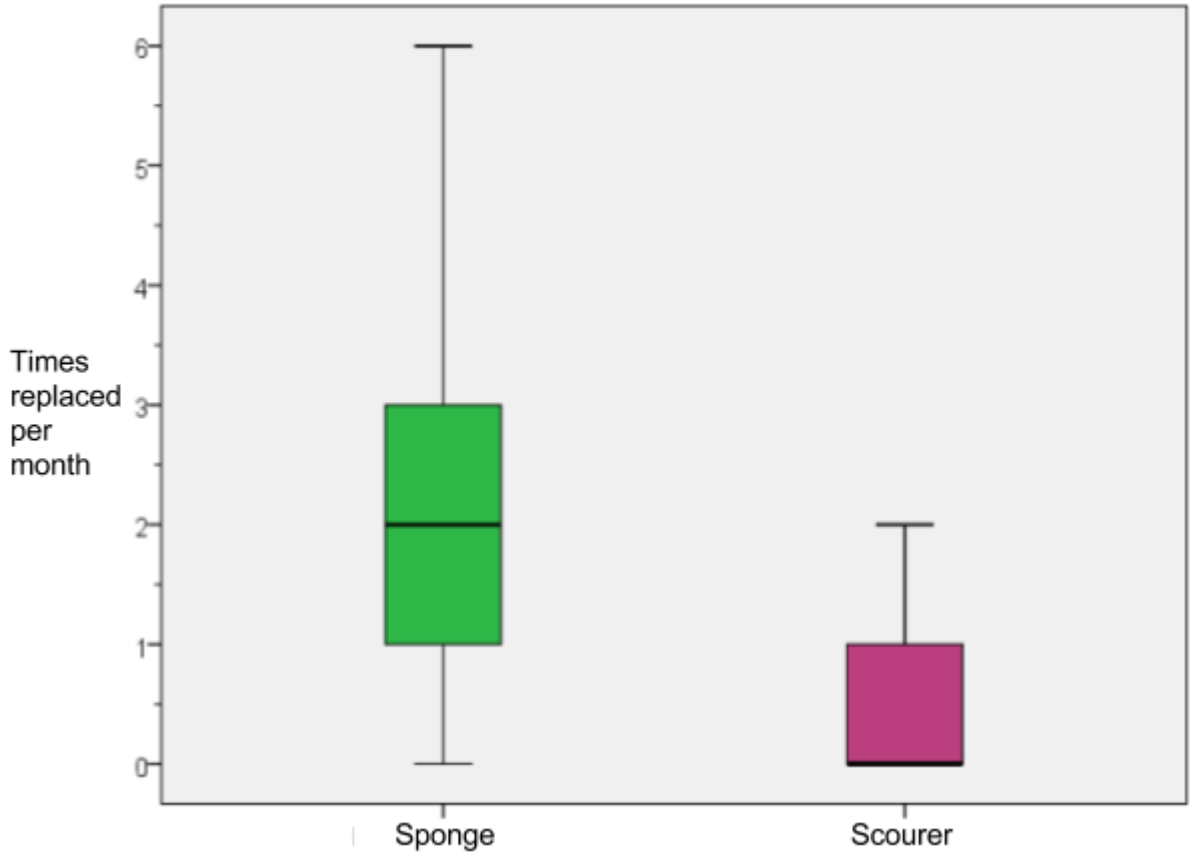
	N	Mean	Std. Deviation
Number of occasions hand washing per week	40	16.73	20.417
Items towel-dried (%)	40	23.10	28.780
Avg. number of items washed	40	10.13	10.892
Times sponge replaced per month	40	2.01	1.243
Times scourer replaced per month	40	.54	.702
How frequently used sponge	40	84.37	29.790
How frequently used scourer	40	30.63	30.743
How frequently used brush	40	38.75	36.228
Valid N (listwise)	40		

Figure 3: Box Plot showing the frequency with which each piece of equipment was used. The available answers were coded (Never = 0, Seldom = 25, Occasionally = 50, Often = 75, Always = 100) such that the data could be treated as scalar



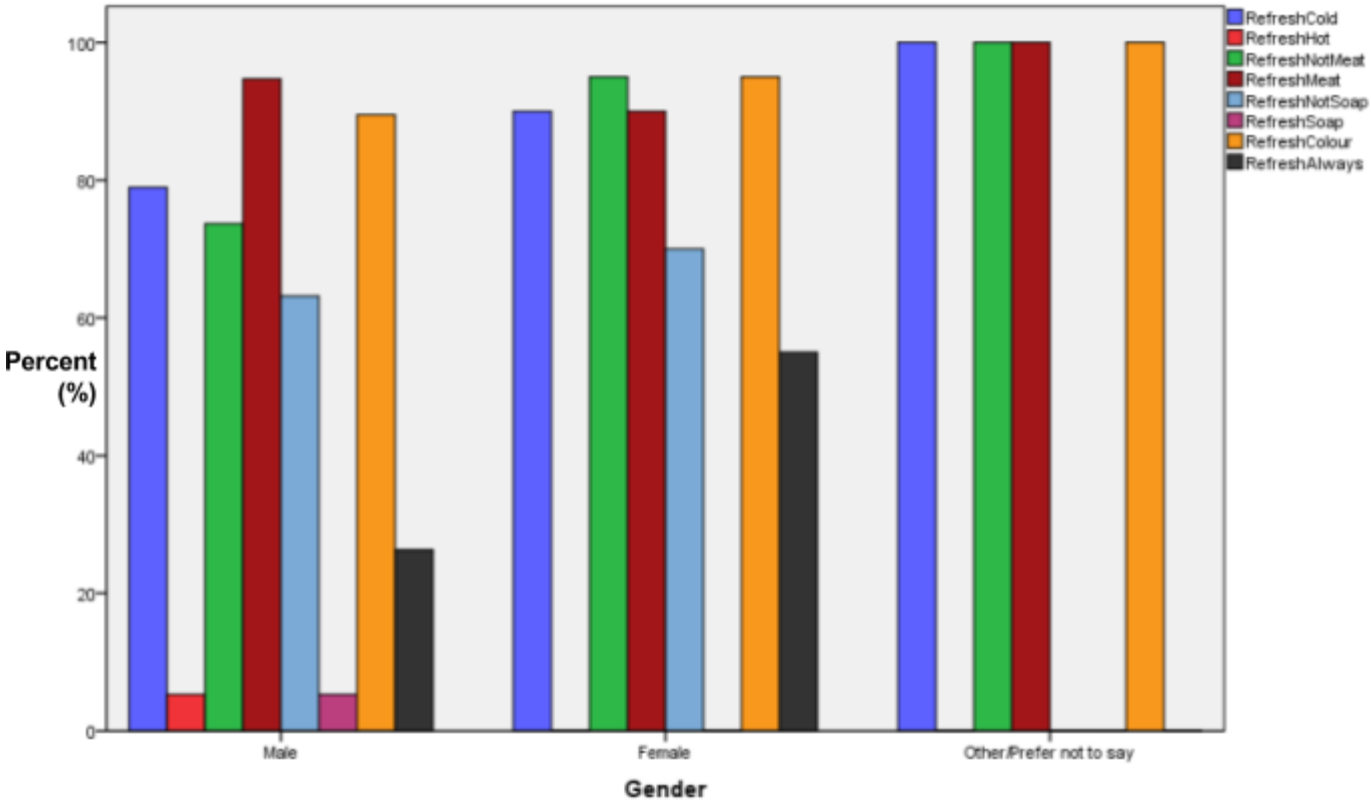
The sponge was the most frequently used piece of equipment, with a median rating of ‘Always’. The brush was used more and had a greater inter-quartile range than the scourer.

Figure 4: Box plot showing frequency of replacement of sponge and scourer



The sponge was replaced more often than the scourer, with a median of 2 compared to a median of 0. This is unsurprising considering the sponge is used more.

Figure 5: Bar chart showing how likely the participants were to refresh the water in the washing-up bowl by gender



The large majority of participants state that they would replace water with the visual indicators of the more common vehicles of outbreaks (food, particularly meat) (Ryan *et al.*, 1996:179) as well as colour, which may be related. The other concerns prompting refreshing were typified as more immediate and practical - the water was cold/not soapy.

Results were mostly ungendered. Fewer males would always refresh or refresh for non-meat food than females.

These results are likely subject to social desirability bias.

Discussion

People are more likely to respond to a questionnaire if interested in the topic (Groves et al., 2004:2; Martin, 1994:327). In-person and telephone methods tend to produce less of an interest bias, but it is unclear how this corresponds to distribution via social media (Kaplowitz et al., 2004; Yu and Cooper, 1983).

As with most observational studies, there was likely some form of observer effect that changed the behaviour of participants. Although some believe this to be a benefit in research (Monahan and Fisher, 2010) it should be considered. As participants tend to behave more prosocially when observed (Benz and Meier, 2008:268) and have a bias towards socially desirable answers in questionnaires (Nederhof, 1985), it can be predicted that the behaviours observed and reported will be skewed towards what the participants believe is good practice. Given this, the areas of concern found in this study are particularly critical to be addressed. There are likely also some bad practices that were not identified.

Slightly more people responded that they would change the water when dirty compared to Stamminger *et al.* (2007:34) - “Water is too turbid / dirty - 80%” compared to 85-92.5%. This may be a cultural difference or that the different (and more specific) wording affected participants’ responses.

Although 40 participants was more than expected, more participants would improve the reliability of results. More participants from other backgrounds would also provide a cultural comparison.

The results corroborated by all 3 methods included: the sponge (a pathogen store) was the most used tool, the tea-towel was used ⅕ to ¼ of the time, and rubber gloves were used infrequently. The area was highly efficient, but technique could be improved for some by batching items in their movement.

The questionnaire suggested different results from the observed frequency of replacing used water, likely due to the aforementioned bias.

Warning of the potential dangers of sponges and tea-towels may lead to them being washed and replaced more frequently, lowering potential risk of infectious disease outbreak.

Word Count: 2000

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Appendix A: Study Information

Dear Participant

I am carrying out a research study for my coursework on the module 14DSB106 (Qualitative Methods) in Loughborough Design School, Loughborough University. The purpose of the study is to look at the task of *'washing up by hand.* Your participation will consist of:

- Observation of activities when carrying out the process of washing up by hand for a period of less than 5 minutes. The data will be recorded for analysis. All the information will be confidential and will be deleted after analysis. All references and images used in the coursework will be anonymous.

If you want further information about the coursework, you can contact the module organiser, Prof. Sue Hignett (S.M.Hignett@lboro.ac.uk).

Yours faithfully,

Andrew Reece
a.z.m.reece-14@student.lboro.ac.uk

Appendix B: Consent Form

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that all procedures have been approved by the Loughborough University Ethical Approvals (Human Participants) Sub-Committee.

I have read and understood the information sheet and this consent form.

I have had an opportunity to ask questions about my participation.

I understand that I am under no obligation to take part in the study.

I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.

I understand that all the information I provide will be treated in strict confidence and will be kept anonymous and confidential to the researchers unless (under the statutory obligations of the agencies which the researchers are working with), it is judged that confidentiality will have to be breached for the safety of the participant or others.

I agree to participate in this study.

Your name _____

Your signature _____

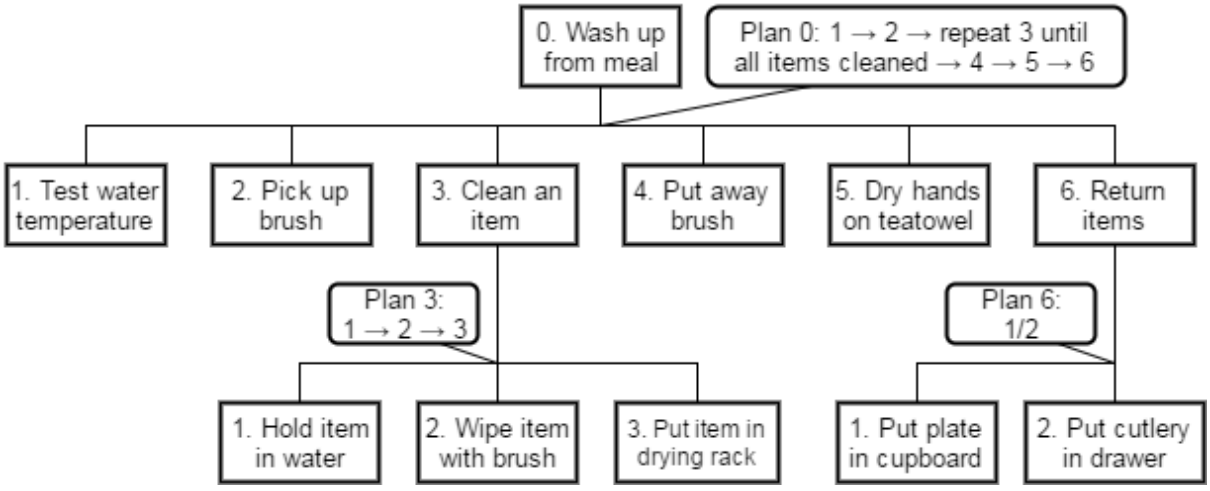
Signature of investigator _____

Date _____

Appendix C: Annotated photo of observed area

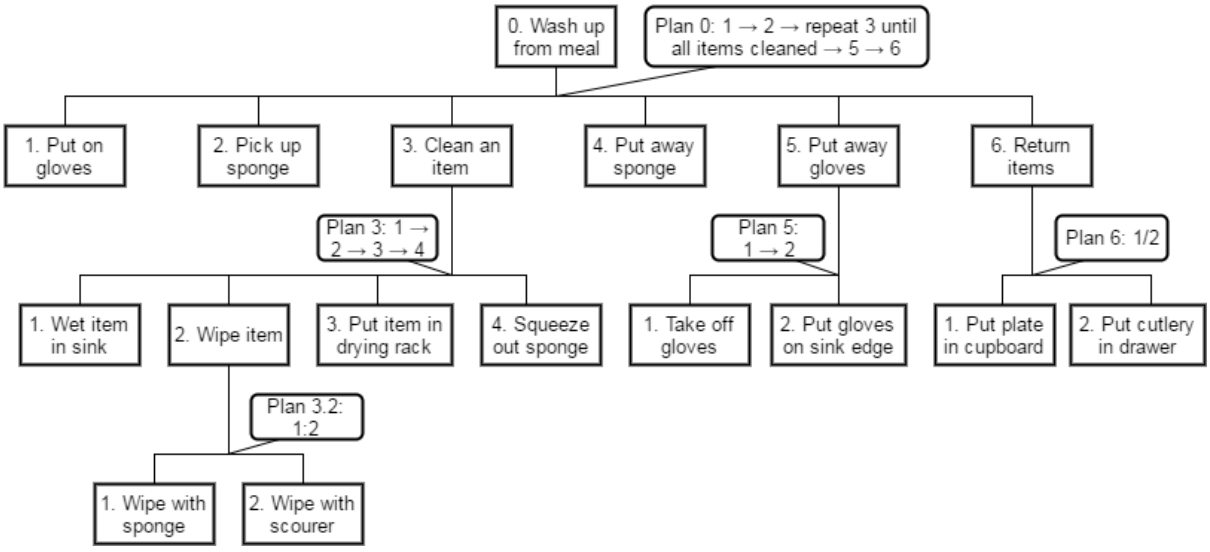
Appendix D: Individual Hierarchical Task Analyses

Participant 1



Super-ordinate number	*Goal* Plan Operations	Notes
0.	*Wash up from meal* Plan 0: 1 → 2 → repeat 3 until all items cleaned → 4 → 5 → 6 1. Test water temperature 2. Pick up brush 3. Clean an item 4. Put away brush 5. Dry hands on tea-towel 6. Return items	6. As items were left to air-dry, a few hours passed before this operation was done.
3.	*Clean an item* Plan 3: 1 → 2 → 3 3.1. Hold item in water 3.2. Wipe item with brush 3.3. Put item in drying rack	
6.	*Return items* Plan 6: 1/2 1. Put plate in cupboard 2. Put cutlery in drawer	

Participant 2



Super-ordinate number	*Goal* Plan Operations	Notes
0.	*Wash up from meal* Plan 0: 1 → 2 → repeat 3 until all items cleaned → 5 → 6	
	1. Put on gloves 2. Pick up sponge 3. Clean an item 4. Put away sponge 5. Put away gloves 6. Return items	6. As items were left to air-dry, a few hours passed before this operation was done.
3.	*Clean an item* Plan 3: 1 → 2 → 3 → 4	
	3.1. Wet item in sink 3.2. Wipe item 3.3. Put item in drying rack 3.4. Squeeze out sponge	
3.2.	*Wipe item* Plan 3.2: 1:2	
	3.2.1. Wipe with sponge 3.2.2. Wipe with scourer	3.2.2. Scourer most useful when remains will not come off with sponge.

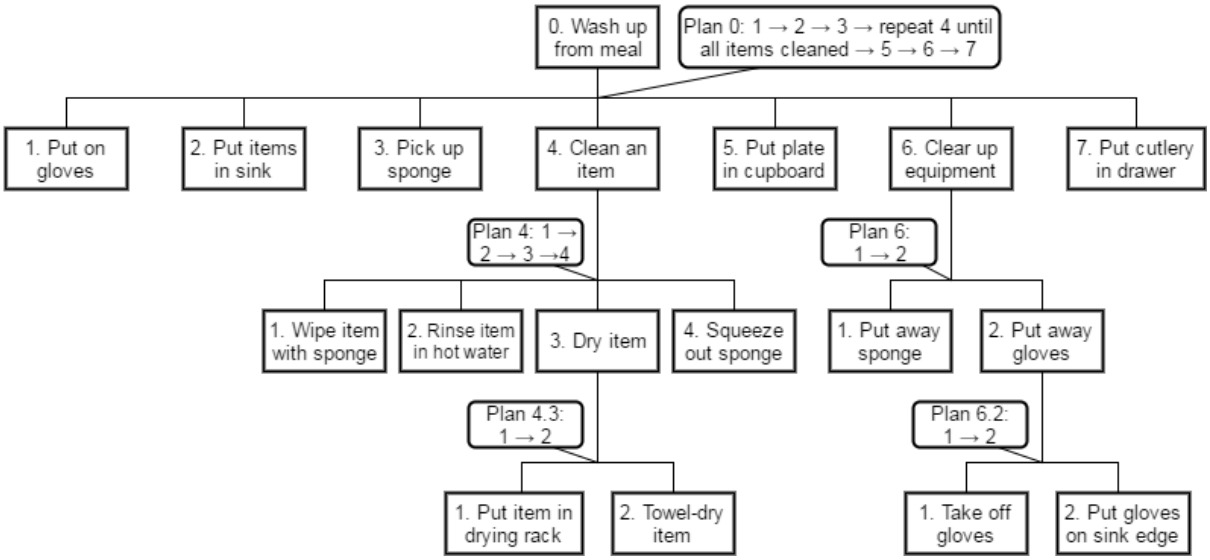
5. *Put away gloves*
Plan 5: 1 → 2

5.1. Take off gloves
5.2. Put gloves on sink edge

6. *Return items*
Plan 6: 1/2

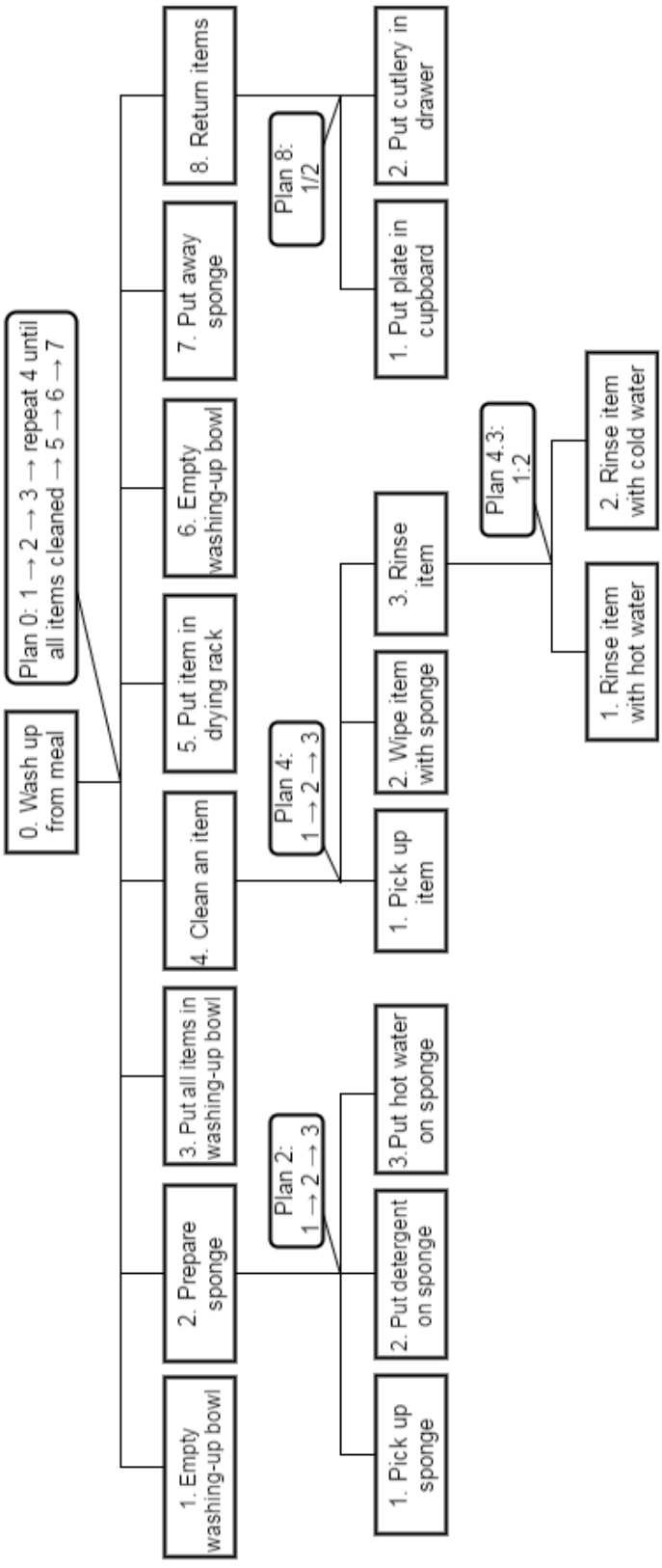
6.1. Put plate in cupboard
6.2. Put cutlery in drawer

Participant 3



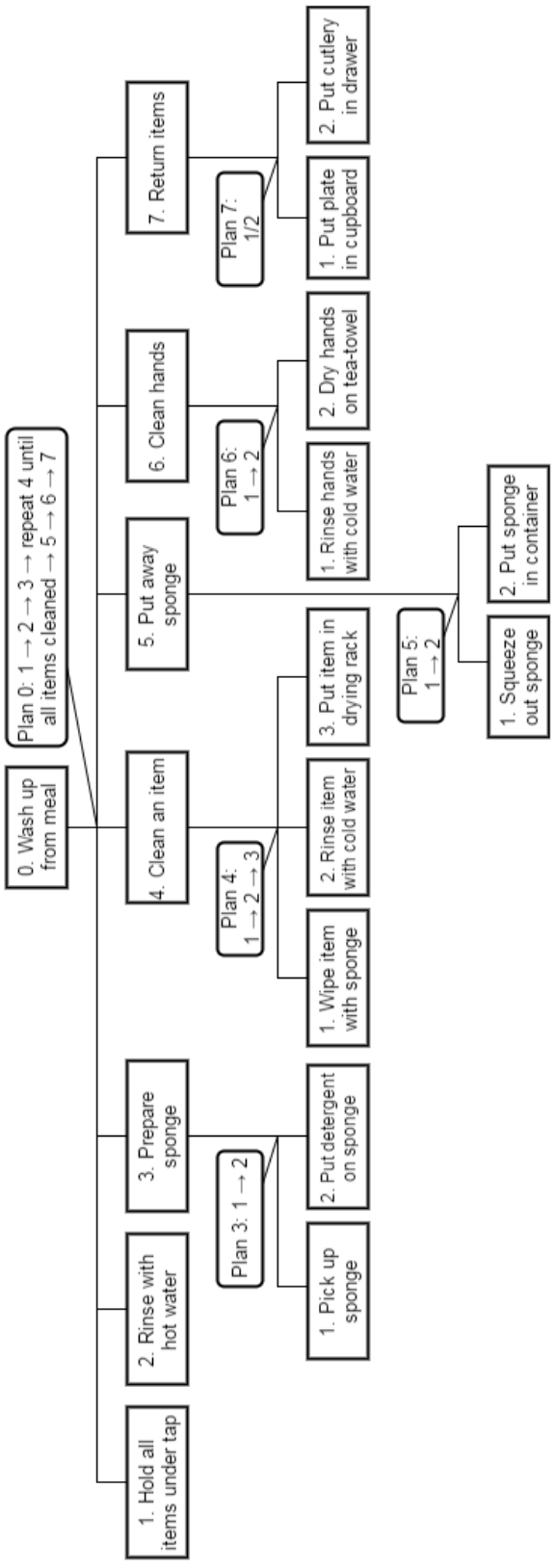
Super-ordinate number	*Goal* Plan Operations	Notes
0.	*Wash up from meal* Plan 0: 1 → 2 → 3 → repeat 4 until all items cleaned → 5 → 6 → 7 1. Put on gloves 2. Put items in sink 3. Pick up sponge 4. Clean an item 5. Put plate in cupboard 6. Clear up equipment 7. Put cutlery in drawer	7. As cutlery was left to air-dry, a few hours pass after finishing the last operation before this is done.
4.	*Clean an item* Plan 4: 1 → 2 → 3 → 4 4.1. Wipe item with sponge 4.2. Rinse item in hot water 4.3. Dry item 4.4. Squeeze out sponge	
4.3.	*Dry item* Plan 4.3: cutlery? Y → 1, N → 2 4.3.1. Put item in drying rack 4.3.2. Towel-dry item	
6.	*Clear up equipment* Plan 6: 1 → 2 2.1. Put away sponge 2.2. Put away gloves	
6.2.	*Put away gloves* Plan 6.2: 1 → 2 6.2.1. Take off gloves 6.2.2. Put gloves on sink edge	

Participant 4



Super-ordinate number	*Goal* Plan Operations	Notes
0.	*Wash up from meal* Plan 0: 1 → 2 → 3 → repeat 4 until all items cleaned → 5 → 6 → 7 1. Empty washing-up bowl 2. Prepare sponge 3. Put all items in washing-up bowl 4. Clean an item 5. Put item in drying rack 6. Empty washing-up bowl 7. Put away sponge 8. Return items	8. As items were left to air-dry, a few hours passed before this operation was done.
2.	*Prepare sponge* Plan 2: 1 → 2 → 3 2.1. Pick up sponge 2.2. Put detergent on sponge 2.3. Put hot water on sponge	
4.	*Clean an item* Plan 4: 1 → 2 → 3 4.1. Pick up item 4.2. Wipe item with sponge 4.3. Rinse item	
4.3.	*Rinse item* Plan 4.3: 1:2 4.3.1. Rinse item with hot water 4.3.2. Rinse item with cold water	More likely to use cold water if item is warm already.
8.	*Return items* Plan 8: 1/2 8.1. Put plate in cupboard 8.2. Put cutlery in drawer	

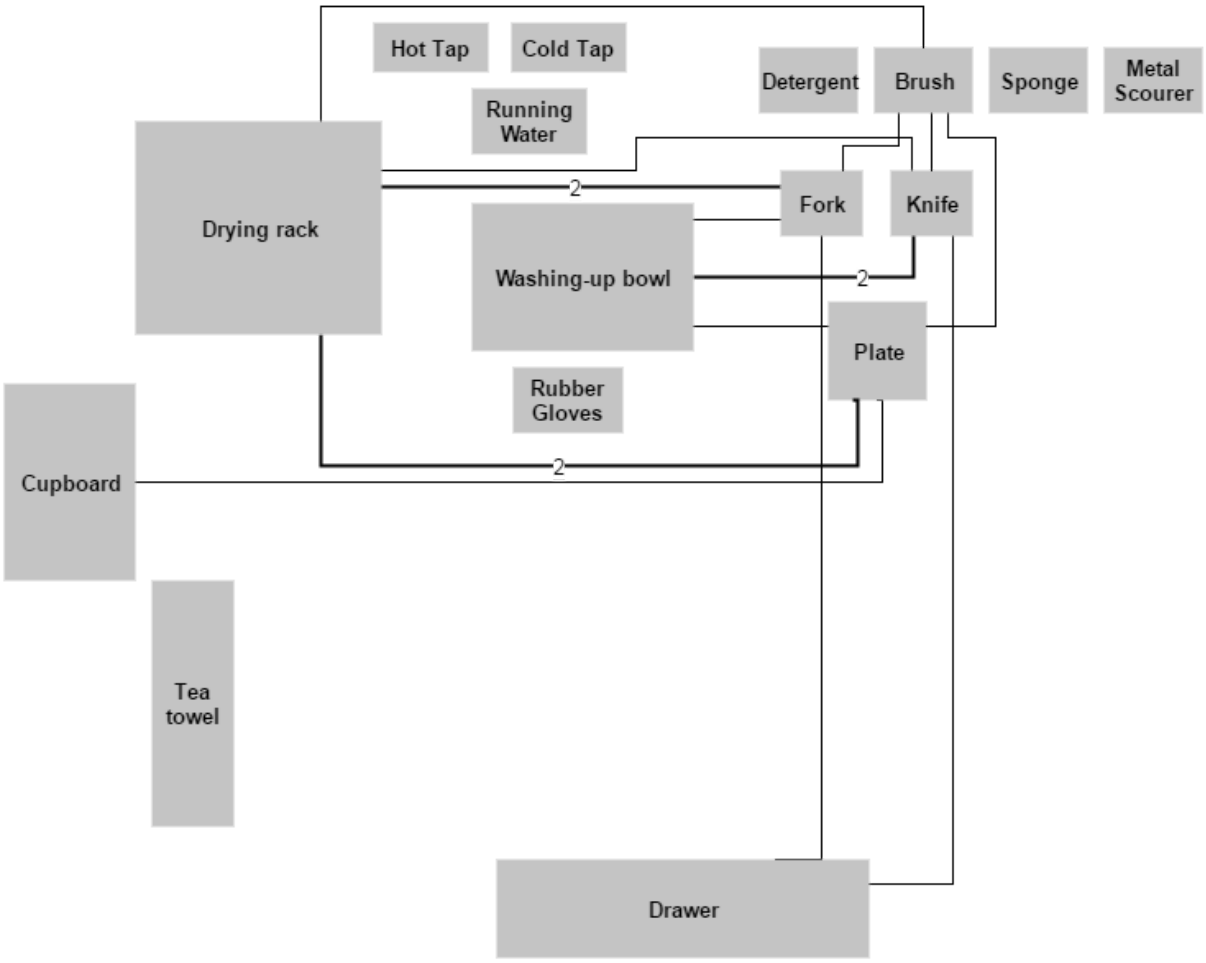
Participant 5



Super-ordinate number	*Goal* Plan Operations	Notes
0.	*Wash up from meal* Plan 0: 1 → 2 → 3 → repeat 4 until all items cleaned → 5 → 6 → 7	
	1. Hold all items under tap 2. Rinse with hot water 3. Prepare sponge 4. Clean an item 5. Put away sponge 6. Clean hands 7. Return items	8. As items were left to air-dry, a few hours passed before this operation was done.
3.	*Prepare sponge* Plan 2: 1 → 2	
	3.1. Pick up sponge 3.2. Put detergent on sponge	
4.	*Clean an item* Plan 4: 1 → 2 → 3	
	4.1. Wipe item with sponge 4.2. Rinse item with cold water 4.3. Put item in drying rack	
5.	*Put away sponge* Plan 5: 1 → 2	
	5.1. Squeeze out sponge 5.2. Put sponge in container	
6.	*Clean hands* Plan 6: 1 → 2	
	6.1. Rinse hands with cold water 6.2. Dry hands on tea-towel	
7.	*Return items* Plan 7: 1/2	
	7.1. Put plate in cupboard 7.2. Put cutlery in drawer	

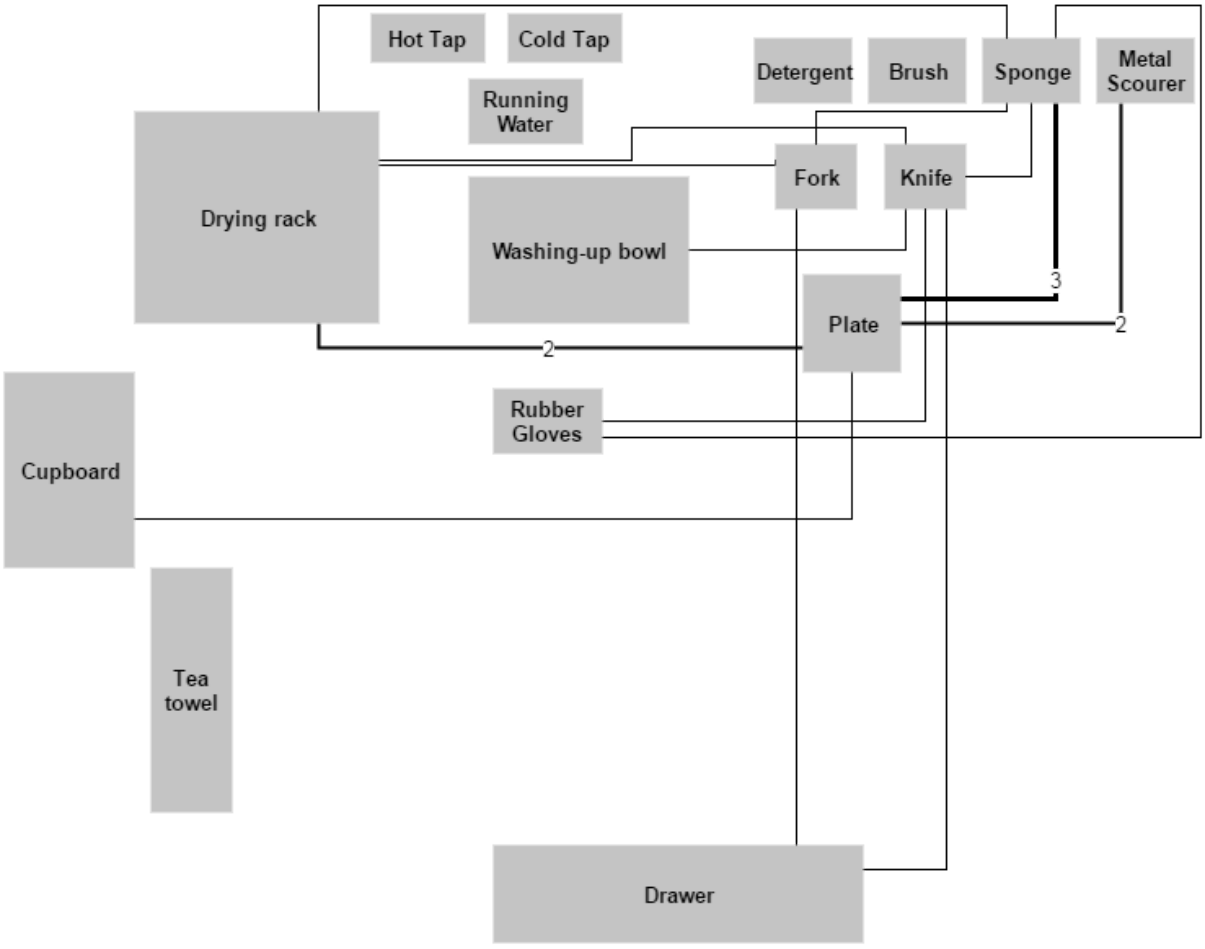
Appendix E: Individual Link Analyses

Participant 1



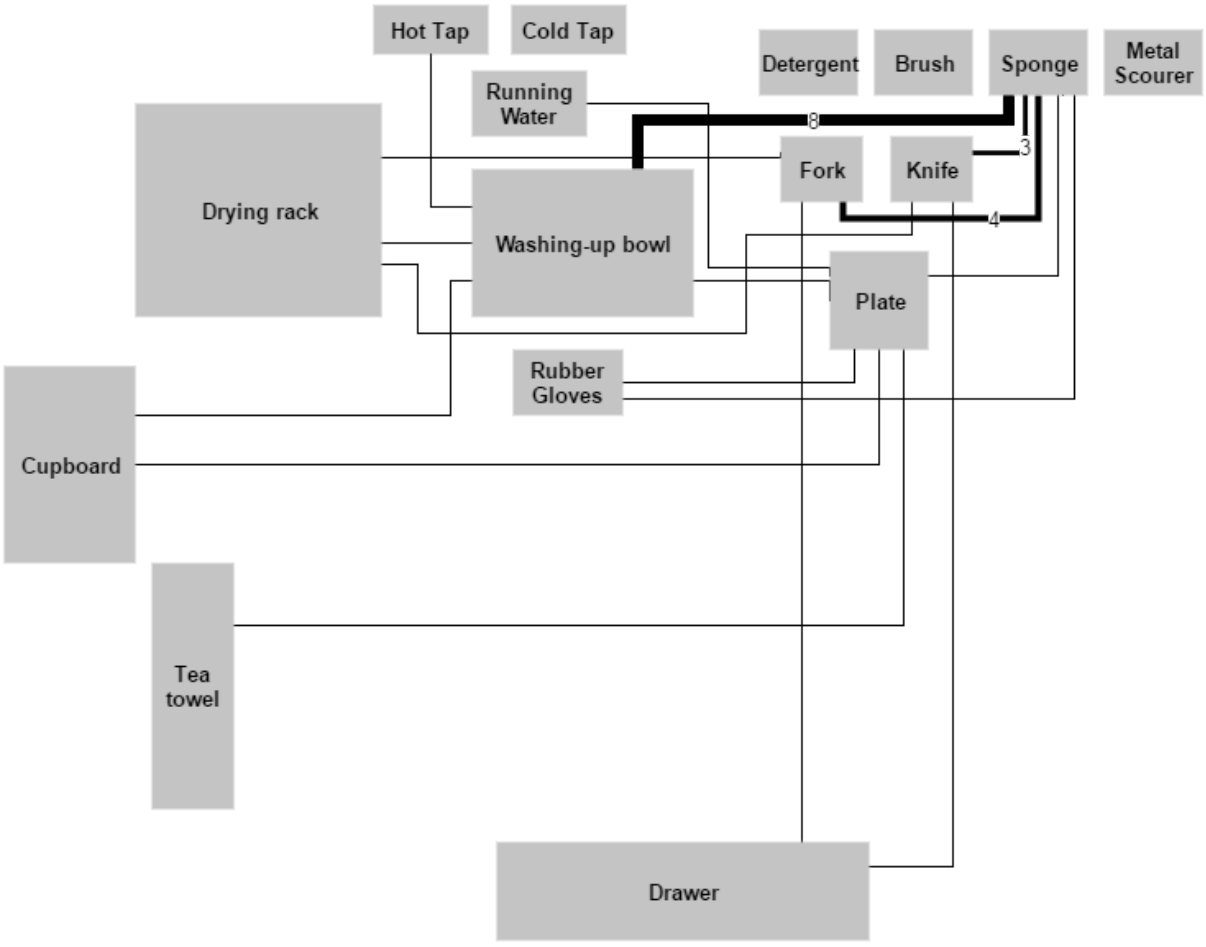
	Rubber gloves	Detergent	Brush	Sponge	Metal Scourer	Fork	Knife	Plate	Hot Tap	Cold Tap	Running Water	Washing-up bowl	Drying rack	Tea-towel	Cupboard	Drawer
Detergent																
Brush																
Sponge																
Metal Scourer																
Fork			1													
Knife			1													
Plate			1													
Hot Tap																
Cold Tap																
Running Water																
Washing-up bowl						1	2	1								
Drying rack			1			2	1	2								
Tea-towel																
Cupboard								1								
Drawer						1	1									

Participant 2



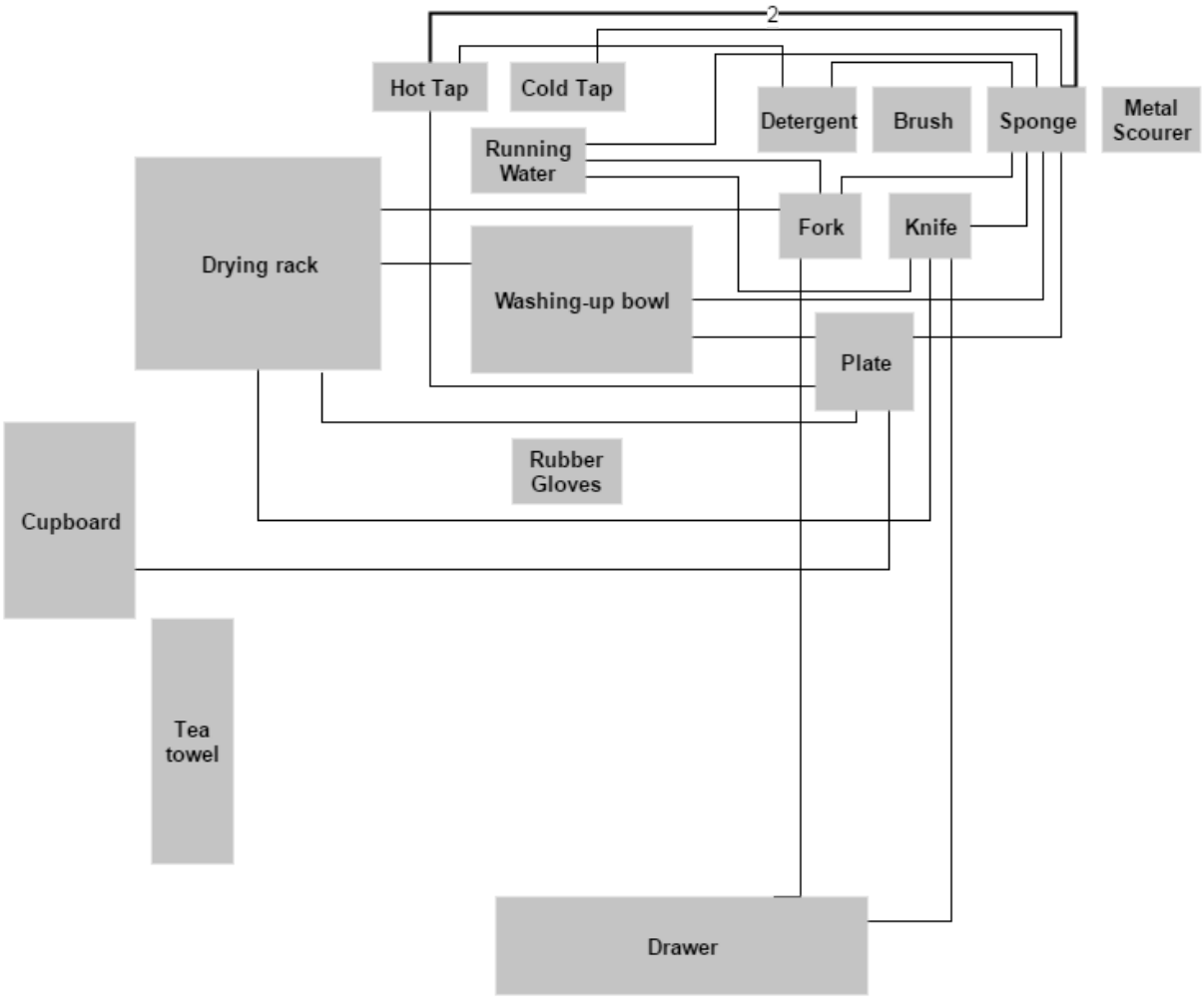
	Rubber gloves	Detergent	Brush	Sponge	Metal Scourer	Fork	Knife	Plate	Hot Tap	Cold Tap	Running Water	Washing-up bowl	Drying rack	Tea-towel	Cupboard	Drawer
Detergent																
Brush																
Sponge	1															
Metal Scourer																
Fork				1												
Knife	1			1												
Plate				3	2											
Hot Tap																
Cold Tap																
Running Water																
Washing-up bowl						1										
Drying rack				1		1	1	2								
Tea-towel																
Cupboard								1								
Drawer						1	1									

Participant 3



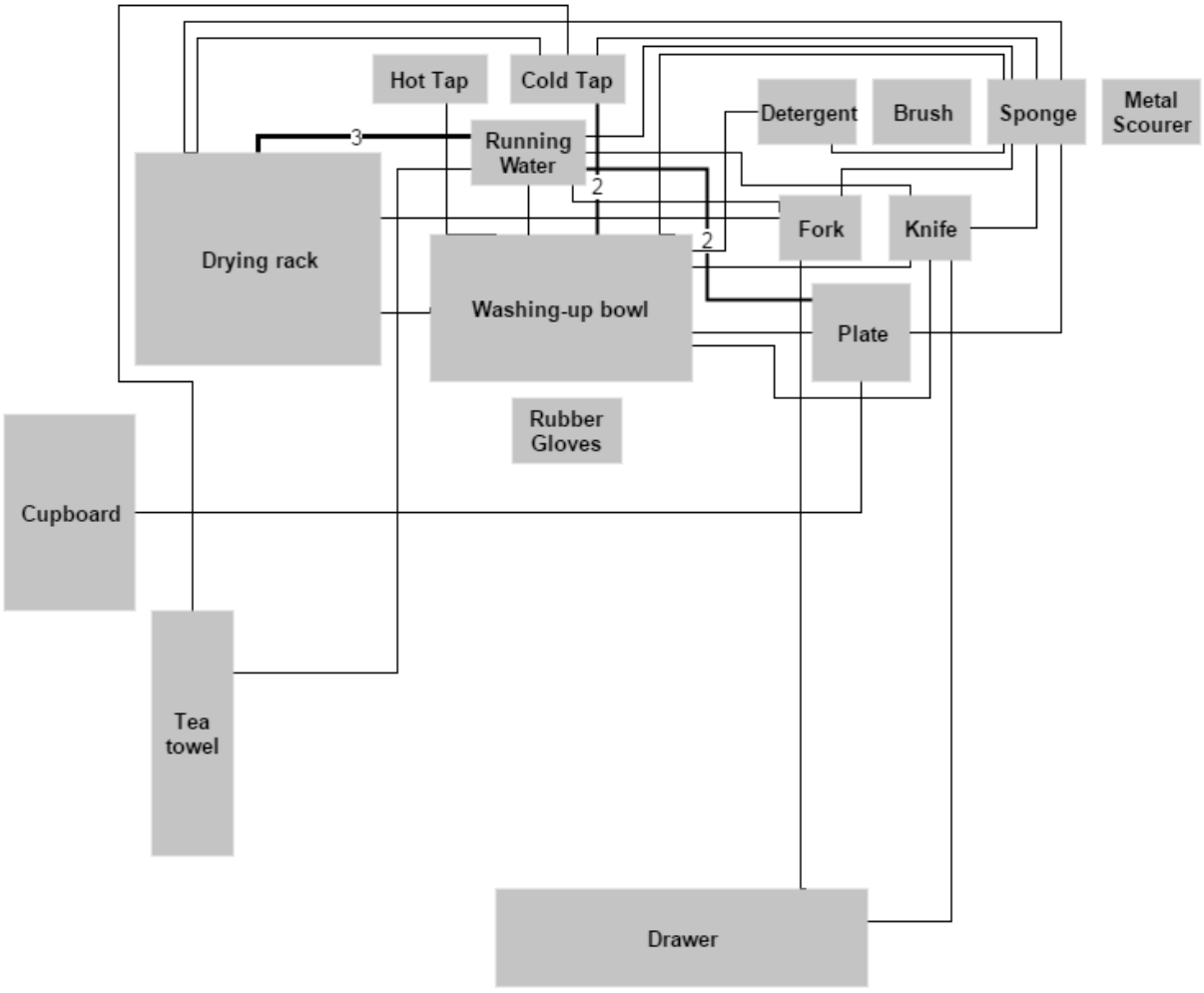
	Rubber gloves	Detergent	Brush	Sponge	Metal Scourer	Fork	Knife	Plate	Hot Tap	Cold Tap	Running Water	Washing-up bowl	Drying rack	Tea-towel	Cupboard	Drawer
Detergent																
Brush																
Sponge	1															
Metal Scourer																
Fork				4												
Knife				3												
Plate	1			1												
Hot Tap																
Cold Tap																
Running Water								1								
Washing-up bowl				8				1	1							
Drying rack						1	1					1				
Tea-towel								1								
Cupboard								1				1				
Drawer						1	1									

Participant 4



	Rubber gloves	Detergent	Brush	Sponge	Metal Scourer	Fork	Knife	Plate	Hot Tap	Cold Tap	Running Water	Washing-up bowl	Drying rack	Tea-towel	Cupboard	Drawer
Detergent																
Brush																
Sponge		1														
Metal Scourer																
Fork				1												
Knife				1												
Plate				1												
Hot Tap		1		2				1								
Cold Tap				1												
Running Water				1		1	1									
Washing-up bowl				1												
Drying rack						1	1	1				1				
Tea-towel																
Cupboard								1								
Drawer						1	1									

Participant 5



	Rubber gloves	Detergent	Brush	Sponge	Metal Scourer	Fork	Knife	Plate	Hot Tap	Cold Tap	Running Water	Washing-up bowl	Drying rack	Tea-towel	Cupboard	Drawer
Detergent																
Brush																
Sponge		1														
Metal Scourer																
Fork				1												
Knife				1												
Plate				1												
Hot Tap																
Cold Tap				1												
Running Water				1		1	1	2								
Washing-up bowl		1		1			1	1	1	2	1					
Drying rack				1		1				1	3	1				
Tea-towel										1	1					
Cupboard								1								
Drawer						1	1									

Appendix F: Questionnaire

The purpose of this questionnaire is to gauge people's habits surrounding washing up their dishes by hand.

All answers will be kept anonymous.

* 1. What is your gender?

- ◯ Male
- ◯ Female
- ◯ Other
- ◯ Prefer not to say

* 2. What is your approximate age?

- ◯ 18-25
- ◯ 26-35
- ◯ 36-45
- ◯ 46-55
- ◯ 56-65
- ◯ 66+
- ◯ Prefer not to say

* 3. For a typical week, please give the number of occasions when would you do the washing up by hand?
(Please enter a number in the range 0-100)

* 4. When you wash up by hand, do you typically use rubber gloves?

- ◯ Yes
- ◯ No

Comments (optional):

* 5. As a percentage, what proportion of your hand-washing do you towel-dry your items as opposed to let them air dry?
(Please enter a number in the range 0-100)

* 6. Each time you do the washing, how many items do you wash up on average?
(Please enter a number in the range 0-100)

* 7. Imagine coming to wash your dishes and the sink/washing-up bowl is half-full of water from the previous user.

Please tick all of the following conditions that would prompt you to empty it and refresh the water:

- [ ] The water is hot
- [ ] The water is not soapy
- [ ] You can see small pieces of food that are not meat
- [ ] You can see small pieces of food that are meat
- [ ] The water is cold
- [ ] The water is soapy
- [ ] The water has a strongly visible colour
- [ ] You always empty water that someone else may have used

Other (please specify)

* 8. How many times per month do you replace your washing-up sponge?
(Please enter a number in the range 0-100)

* 9. How many times per month do you replace your metal scourer?
(Please enter a number in the range 0-100)

* 10. How often do you use the following:

	Never	Seldom	Occasionally	Often	Always
Washing-up sponge	○	○	○	○	○
Metal scourer	○	○	○	○	○
Brush	○	○	○	○	○

Done

Appendix G: Raw Data

	Gender	Age	Handwash Occasions	Rubber Gloves	TowelDry Percentage	Wash Upitems	Refresh Cold	Refresh Hot	Refresh NotMeat	Refresh Meat	RefreshNot Soap	Refresh Soap	Refresh Colour	Refresh Always	Replace Sponge	Replace Scourer	Frequency Sponge	Frequency Scourer	Frequency Brush
1	Female	18-25	21	Yes	30	4	Yes	No	Yes	Yes	No	No	Yes	No	3	0	Always	Occasionally	Never
2	Female	18-25	18	No	90	3	Yes	No	Yes	Yes	Yes	No	Yes	No	2	0	Often	Never	Often
3	Male	18-25	12	No	25	4	Yes	No	No	Yes	No	No	No	No	2	0	Always	Often	Never
4	Male	18-25	21	Yes	5	5	Yes	No	Yes	Yes	Yes	No	Yes	No	1	1	Always	Occasionally	Occasionally
5	Male	18-25	7	No	5	10	Yes	No	Yes	Yes	Yes	No	Yes	No	2	2	Seldom	Seldom	Always
6	Female	18-25	10	No	30	10	Yes	No	Yes	Yes	Yes	No	Yes	No	6	1	Always	Seldom	Occasionally
7	Female	18-25	9	No	10	4	Yes	No	Yes	Yes	Yes	No	Yes	Yes	2	0	Always	Seldom	Occasionally
8	Female	18-25	10	No	0	5	Yes	No	Yes	Yes	Yes	No	Yes	No	3	0	Always	Never	Occasionally
9	Female	18-25	7	No	40	7	Yes	No	Yes	Yes	Yes	No	Yes	Yes	3	0	Always	Never	Never
10	Male	18-25	15	No	25	6	No	No	No	Yes	Yes	No	Yes	No	2	1	Always	Often	Never
11	Female	18-25	10	No	60	5	Yes	No	Yes	Yes	Yes	No	Yes	No	2	1	Often	Occasionally	Often
12	Male	18-25	20	No	0	10	Yes	No	Yes	Yes	No	No	Yes	Yes	3	1	Often	Seldom	Often
13	Male	18-25	16	No	10	15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2	2	Always	Always	Occasionally
14	Female	18-25	6	No	10	9	Yes	No	Yes	Yes	Yes	No	Yes	No	4	0	Always	Never	Occasionally
15	Female	18-25	15	No	3	4	Yes	No	Yes	Yes	No	No	Yes	Yes	1	1	Always	Occasionally	Never
16	Other/P...	26-35	5	No	100	2	Yes	No	Yes	Yes	No	No	Yes	No	2	1	Often	Seldom	Occasionally
17	Male	18-25	7	No	0	3	No	No	No	Yes	No	No	No	No	0	0	Never	Never	Always
18	Female	Prefe...	100	No	0	37	Yes	No	Yes	Yes	No	No	Yes	Yes	1	0	Never	Never	Never
19	Male	18-25	21	No	0	50	Yes	No	Yes	Yes	Yes	No	Yes	Yes	2	2	Always	Often	Seldom
20	Male	18-25	2	No	0	24	Yes	No	No	No	Yes	No	Yes	No	1	0	Never	Never	Occasionally
21	Male	26-35	100	Yes	10	25	Yes	No	Yes	Yes	Yes	No	Yes	No	2	0	Always	Seldom	Never
22	Female	26-35	20	No	0	7	No	No	No	No	No	No	No	Yes	2	0	Always	Never	Never
23	Male	18-25	1	No	3	2	Yes	No	Yes	Yes	Yes	No	Yes	No	0	0	Occasionally	Seldom	Seldom
24	Male	18-25	14	No	5	0	Yes	No	Yes	Yes	No	No	Yes	No	2	0	Always	Never	Seldom
25	Female	18-25	15	No	20	20	Yes	No	Yes	Yes	Yes	No	Yes	Yes	2	2	Often	Occasionally	Often
26	Male	18-25	7	No	50	5	Yes	No	Yes	Yes	Yes	No	Yes	No	1	1	Always	Often	Often
27	Male	18-25	15	No	0	5	Yes	No	No	Yes	No	No	Yes	No	1	1	Always	Seldom	Never
28	Male	18-25	7	No	30	10	Yes	No	Yes	Yes	Yes	No	Yes	Yes	0	0	Always	Never	Occasionally
29	Male	18-25	4	No	10	30	Yes	No	Yes	Yes	Yes	No	Yes	Yes	3	2	Always	Occasionally	Seldom
30	Male	18-25	12	No	30	4	No	No	No	Yes	No	No	Yes	No	1	0	Always	Always	Always
31	Female	18-25	21	No	80	3	Yes	No	Yes	Yes	No	No	Yes	No	1	0	Always	Occasionally	Occasionally
32	Female	18-25	20	No	50	4	Yes	No	Yes	Yes	Yes	No	Yes	No	3	1	Occasionally	Seldom	Always
33	Female	18-25	21	No	10	5	Yes	No	Yes	Yes	Yes	No	Yes	Yes	1	0	Always	Never	Never
34	Female	18-25	25	No	20	3	Yes	No	Yes	Yes	Yes	No	Yes	Yes	4	1	Often	Occasionally	Often
35	Female	18-25	5	No	1	15	Yes	No	Yes	Yes	Yes	No	Yes	No	3	1	Always	Often	Never
36	Male	18-25	14	No	2	4	Yes	No	Yes	Yes	Yes	No	Yes	No	4	0	Always	Never	Never
37	Female	18-25	5	No	10	6	Yes	No	Yes	Yes	Yes	No	Yes	Yes	1	0	Always	Never	Never
38	Male	18-25	7	No	0	5	No	No	Yes	Yes	No	No	Yes	No	2	0	Always	Never	Never
39	Female	18-25	21	No	50	30	No	No	Yes	No	No	No	Yes	Yes	1	1	Always	Seldom	Always
40	Female	18-25	3	No	100	5	Yes	No	Yes	Yes	Yes	No	Yes	Yes	3	0	Always	Never	Never