

1 **Microplastics in personal care products: Exploring perceptions of environmentalists,**  
2 **beauticians and students**

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17

18 **Abstract**

19 Microplastics enter the environment as a result of larger plastic items breaking down  
20 ('secondary') and from particles originally manufactured at that size ('primary'). Personal  
21 care products are an important contributor of secondary microplastics (typically referred to  
22 as 'microbeads'), for example in toothpaste, facial scrubs and soaps. Consumers play an  
23 important role in influencing the demand for these products and therefore any associated  
24 environmental consequences. Hence we need to understand public perceptions in order to  
25 help reduce emissions of microplastics. This study explored awareness of plastic microbeads  
26 in personal care products in three groups: environmental activists, trainee beauticians and  
27 university students in South West England. Focus groups were run, where participants were  
28 shown the quantity of microbeads found in individual high-street personal care products.  
29 Qualitative analysis showed that while the environmentalists were originally aware of the  
30 issue, it lacked visibility and immediacy for the beauticians and students. Yet when shown  
31 the amount of plastic in a range of familiar everyday personal care products, all participants  
32 expressed considerable surprise and concern at the quantities and potential impact.  
33 Regardless of any perceived level of harm in the environment, the consensus was that their  
34 use was unnatural and unnecessary. This research could inform future communications with  
35 the public and industry as well as policy initiatives to phase out the use of microbeads.

1 **Keywords:** microplastic; personal care products; debris; microparticles; public attitudes

## 2 **1. Background**

3 It is estimated that 275 million metric tonnes (MT) of plastic waste were generated across  
4 192 coastal countries in 2010, with 4.8 to 12.7 million MT entering the ocean, (Jambeck et  
5 al., 2015). Over the past two decades, plastic marine litter has developed into a high-profile  
6 international environmental issue, but regulatory efforts to address it have thus far been  
7 inadequate and calls have been made to classify plastic waste as hazardous (Rochman et al.,  
8 2013). International treaties are currently insufficient in their scope, penalties and standards  
9 or enforcement to deal with the problem adequately (see Gold et al., 2013). Microplastic  
10 debris, defined as pieces or fragments less than 5 mm in diameter (Law & Thompson, 2014),  
11 is increasingly recognised as a key emerging global sustainability issue and yet no in-depth  
12 research has been undertaken into public awareness, attitudes and behaviour (Hidalgo &  
13 Thiel, 2013; Gold et al., 2013; UNEP, 2009; Wyles et al., 2015). Microplastics can accumulate  
14 in the oceans indirectly as a consequence of the fragmentation of larger items in the  
15 environment ('secondary microplastics'); they can also enter directly as a consequence of  
16 the release of microplastic sized particles to the environment ('primary microplastics'). One  
17 such direct source of microplastics is the use of small particles of plastic (commonly referred  
18 to as microbeads when used in cosmetics) in personal care products including facial scrubs  
19 and cosmetics.

20 Within the personal care and cosmetic industries, many products include microplastic  
21 particles in their ingredients, and it is estimated that between 4594 and 94,500 microbeads  
22 could be released from an exfoliant in a single use (Napper et al., 2015). The findings of a  
23 Cosmetics Europe Survey and Euromonitor International data suggest that in the region of  
24 4130 tonnes of microbeads per year are used in cosmetics in EU countries plus Norway and  
25 Switzerland (Gouin et al., 2015). These particles are likely to be released to domestic waste  
26 water as a consequence of use. Because of their small size (approximately 250 microns in  
27 diameter) it is highly likely that some of these particles will subsequently pass through  
28 sewage treatment and enter aquatic environments (Duis & Coors, 2016). There is growing  
29 evidence about the potential for microplastics to cause harm in the environment, and so the  
30 use of plastic microbeads in consumer products such as facial scrubs has recently attracted  
31 widespread scientific attention, and it has been suggested they pose a threat to the marine  
32 environment (Eriksen et al., 2013; Fendall & Sewell, 2009; Law & Thompson, 2014; Wright et  
33 al., 2013). Over recent years, these issues have increasingly been communicated to the  
34 wider public. A number of TV documentaries including 'Plastic Planet' (2009) and 'Midway,  
35 Message from the Gyre' (2013) have focused on plastic litter. An increasing number of  
36 projects and websites are dedicated to marine debris and microplastics, such as NOAA  
37 Marine debris programme, the 5 Gyres Foundation, Marlisco, PlasticTides, International  
38 Pellet Watch and Beat the Micro bead (Laboratory of Organic Geochemistry, 2013;  
39 Marlisco, 2014; NOAA, 2015; Plastic Soup Foundation & Stichting De Noordzee, 2016; The 5

1 Gyres Institute, 2016). Campaigns calling for the use of microbeads in personal care  
2 products to be banned have had some success with legislation being introduced in some  
3 countries and some manufacturers beginning to phase them out (Badore, 2013; Barlas,  
4 2015; Carrington, 2016; Whyte & Sherden, 2016; UNEP, 2015). Any such legislation needs to  
5 have the objective of reducing or eliminating unnecessary emissions of solid plastic particles  
6 to the environment. Considerable progress has been made in countries such as the US and,  
7 at the time of writing, is high on the agenda in the UK. Following a House of Commons  
8 briefing paper in August 2016, the UK's Environmental Audit Committee recommended that  
9 the government introduce a legislative ban on the use of plastic microbeads in cosmetics  
10 and other toiletries (House of Commons, 2016; House of Commons Environmental Audit  
11 Committee Report, 2016).

12 Given the timely and topical nature of this issue, it is important to understand how people  
13 perceive the issues and their attitudes towards regulation. It is important to study  
14 perceptions "because beliefs (even when they turn out to be completely wrong) can have  
15 real consequences in the world" (Pidgeon et al., 2012: 4177), as can be seen in the case of  
16 the controversies over the measles, mumps and rubella vaccine (MMR) and genetically  
17 modified (GM) crops. Focus groups with groups of consumers can provide significant insight  
18 into positions underlying values and trust (for example, attitudes to industry and  
19 government and towards interference with 'nature') which are not usually considered by  
20 scientists or formal risk-management approaches. Beliefs impact on engagement and  
21 contestation; the public can exert a powerful influence through their purchasing behaviour  
22 (consumer demand) and through active resistance by supporting campaigns via signing  
23 petitions etc.

24 While opinion surveys suggest there is considerable concern among European citizens about  
25 ocean pollution and marine issues in general (Chilvers et al., 2014; Gelcich et al., 2014;  
26 Hartley et al., under review; Wyles, et al., 2014), awareness about microplastics in the  
27 marine environment appears to be low (Jacobs et al., 2015). In surveys where people are  
28 asked to rank the most important environmental issues regarding the coastline or sea,  
29 microplastics are not generally mentioned spontaneously (e.g. Santos et al., 2005; Potts et  
30 al., 2011). This is perhaps not surprising given that these studies were before microplastics  
31 really came to prominence (e.g. the term microplastic or microbead has been found within  
32 printed media more frequently since 2012; Wyles et al., 2015) but it also suggests that  
33 people are unaware that large plastic items break down into smaller pieces in the  
34 environment. Microplastics in personal care products specifically have had some media  
35 coverage in recent times but there is still no in-depth research on people's perceptions of  
36 this issue. Indeed, it is increasingly recognized that greater communication efforts are  
37 needed in order to focus on solutions as well as threats (Clamer, 2011; Steel et al., 2005;  
38 UNEP, 2005, 2009; Veiga et al., 2016).

1 Some exploratory social survey research has been undertaken. Chang (2015) administered  
2 an online survey which asked 175 US respondents (most of whom were regular users of  
3 facial scrubs and in their 20s) about whether they were aware that microplastics were  
4 present in skin care products, finding that 75% participants used facial scrubs but 72% were  
5 not aware of the presence of microbeads. In a Greenpeace (2016) survey, 68% of UK  
6 respondents did not know what microbeads were. Further research is needed to analyse  
7 why there is so little awareness of the issues and how different sections of the public  
8 perceive the use of microbeads in personal care and cosmetic products.

9

## 10 **2. Study Aims**

11 People's perceptions of environmental risk involve a range of concerns and value-based  
12 questions that involve factors such as: trust in decision-makers; attitudes towards related  
13 issues; the extent to which it evokes an emotional response; and the degree of visibility and  
14 uncertainty surrounding the risks (Pidgeon et al., 2012). The main aim of our study was to  
15 explore, in an in-depth analysis, participants' responses to the use of microplastics in  
16 personal care and cosmetic products. It sought to explore perceptions through first  
17 capturing spontaneous responses about these products and microbeads, and then  
18 examining attitudes once further information was provided and the problem was made  
19 tangible and visible. Visualisation is regarded as a crucial process in communicating  
20 environmental issues that are not accessible to direct experience (e.g., Pahl et al., 2016;  
21 Sheppard, 2012). The present study was able to build on a recently published analysis of  
22 microplastic samples in cosmetics (Napper et al., 2015) by using the extracted samples to  
23 visualise the issue and gather people's reactions.

24 This exploratory study fills an important gap in the literature by examining in detail people's  
25 views on the use of microbeads in personal care products, their sources of information, and  
26 their opinions on possible solutions. As a multidisciplinary piece of research, it bridges the  
27 natural and social sciences, drawing on insights from marine science and social psychology.  
28 It comes at a crucial time for policy intervention and sheds light on the kinds of factors that  
29 influence people's perceptions and responses, and what sorts of barriers communicators  
30 might benefit from being aware of.

31

## 32 **3. Methods**

33 The previous limited research on people's attitudes to microplastics in personal care  
34 products has employed quantitative methods to elicit perceptions (e.g. Chang, 2015). As we  
35 sought to gain a rich, in-depth, understanding of people's views about the use of  
36 microbeads in personal care products, a qualitative approach was most appropriate using a  
37 constructivist paradigm which asserts that researchers must rely upon participants' views of

1 the topic, and let them speak for themselves, rather than impose their own meanings  
 2 (Bryman, 2012). Focus groups are a widely used technique in qualitative social science  
 3 research (Barbour, 2008; Krueger & Casey, 2009). They concentrate on capturing the  
 4 complexities of opinion formation – the ambiguities and ambivalences and what leads  
 5 people to change their minds (Bickerstaff et al., 2006). Each focus group usually contains  
 6 between 7-10 participants to provide a mix of characteristics (e.g. age, gender, geographic  
 7 distribution) but they are not designed to be representative. The groups are selected  
 8 because they have certain characteristics in common that relate to the topic of the focus  
 9 group (Morgan & Krueger, 1998).

10

### 11 **3.1 Sample**

12 The sample included: 1] participants who were considered ‘well informed’ about  
 13 microplastics and marine litter, as they were active in a local marine-focussed  
 14 environmental group, 2] undergraduate university students (x 2 focus groups) who were  
 15 anticipated to have a range of knowledge, and 3] beauty therapy trainees who potentially  
 16 work with facial scrubs and other beauty products containing microbeads.

17 As a token incentive, all the participants were offered lunch and the option of entering a £30  
 18 prize draw. Individual participants were recruited via an advertisement containing  
 19 photographs of various beauty products asking “how do these products work”, so it was not  
 20 surprising that there were many more women than men ( $n = 20, 2$  respectively) who  
 21 volunteered to take part (see Table 1).

22 **Table 1 Demographic details of the participants**

	Area of work	Age	Sex
FG1	Environmentalists		
1	Retired	55+	F
2	Translator	36-45	F
3	Mentor	46-55	F
4	Art facilitator/Cleaner	46-55	F
5	Support worker	26-35	F
6	Student	18-25	M
FG2/3	Undergraduates		
7	2 <sup>nd</sup> yr International Tourism and Management	18-25	F
8	2 <sup>nd</sup> yr Criminology and Psychology	18-25	F
9	3 <sup>rd</sup> yr Criminology and Psychology	18-25	F
10	3 <sup>rd</sup> yr Environmental Science	18-25	F
11	1 <sup>st</sup> yr Business Management	18-25	F
12	3 <sup>rd</sup> year Environmental Science	18-25	F
13	1 <sup>st</sup> yr Psychology and Criminal Justice	18-25	F
14	2 <sup>nd</sup> yr IT	18-25	F
FG 4	Hairdresser/beautician trainees		

15	Hairdresser trainee	18-25	F
16	Hairdresser trainee	16-17	M
17	Hairdresser trainee	18-25	F
18	Beauty therapy trainee	18-25	F
19	Hairdresser trainee	18-25	F
20	Beauty therapy lecturer	18-25	F
21	Hairdresser trainee	16-17	F
22	Beauty therapy trainee	18-25	F

1

## 2 **3.2 Process**

3 The participants were invited to the provided lunch before or during the session to maintain  
 4 an informal atmosphere and put the participants at their ease. An information sheet gave all  
 5 the participants some insight into what would take place but the interviewer stressed they  
 6 could stop the focus group and leave at any time should they want to and that their data  
 7 would then be removed from the final transcript. It was also explained that names would  
 8 be changed in the transcript and no data would be traceable. The discussion was recorded  
 9 digitally.

10 The interviewer used a standardised topic guide to cover three main phases in the  
 11 discussion: (1) information gathering, (2) reactions and (3) ideas for change. At step 1 the  
 12 intact products were shown to the participants and they were asked whether they were  
 13 familiar with these and if so how they worked. Here we were interested in finding out  
 14 whether participants knew both how the ‘scrubbing’ occurred and also what did the  
 15 scrubbing. Once this section of the questioning had taken place, at Step 2 the interviewer  
 16 presented the samples of plastic microbeads, which had been removed from the products  
 17 (Napper et al., 2015) and placed in specimen jars (see Figure 1), and asked the group what  
 18 they thought of the products now they knew they contained plastic. They were then asked  
 19 what they thought happened to the plastic and where it went. Participants were  
 20 encouraged to examine the jars and pass them around the group. This was seen as a key  
 21 moment in the focus group, as we were keen to explore the impact of new knowledge.



22

23 Figure 1. The samples of microbeads extracted from six different facial products.

24 Photo Credit: Imogen Napper, Plymouth University

1 The interviewer (the second author, JG) had no expert knowledge about marine pollution,  
2 which ensured minimal input into the content of the discussion. Finally at Step 3 the  
3 interviewer asked the group about their ideas concerning possible solutions.

4 Framework analysis was used to manage the data (Ritchie & Spencer, 1994). A table was  
5 created with the questions in the topic guide down one side and the individual focus groups  
6 identifiers along the top. Responses to each question were entered into the corresponding  
7 boxes until all the data in the transcripts had been transferred. The research team then met  
8 to discuss the findings across the focus groups in response to each question to develop  
9 some initial themes. Following the discussions, the primary researcher (JG) developed final  
10 themes and discussed them with members of the team until consensus was reached.

#### 11 **4. Results**

12 Three key thematic areas were covered across the focus groups: information gathering,  
13 reactions, and ideas for change. Here, the results section contains examples of responses to  
14 each of the questions within each of these. The quotation identifiers describe the three  
15 main groups of participants in the study - university students (S), environmentalists (E) and  
16 beauticians (B).

#### 17 **Theme 1: Information gathering**

##### 18 **Question 1 - How do you think these products work?**

19 All participants were familiar with the products, some, for example the environmentalists,  
20 knew they contained plastics and were aware they had used them in the past. The majority  
21 of participants knew how they worked:

22 *To get a cleaner complexion, they remove dead skin cells. (B)*

23 *the bits in it just like rub out the stuff in your pores. (S)*

24 In terms of the ingredients used some beautician trainees had either never thought about  
25 the contents of the scrubs or thought they contained natural ingredients:

26 *They could be anything; sometimes they're like crushed nuts or sand, anything gritty.*  
27 *(B)*

##### 28 **Question 2 - What happens to them when you have used them/ where do they go?**

29 The majority of the participants had some idea about the fact that following use the  
30 contents of the product would be washed away into the sewers and then '*into the ocean*'.  
31 The environmentalists described how shocked they had been when they first discovered so  
32 much plastic on the beaches close to their home:

1            *I was really sort of shocked at how much more plastic there was on the beaches than*  
2            *when I'd grown up here. (E)*

3    Large lumps of plastic are easy to see. The environmentalists pointed out that:

4            *this is like the elephant in the room because it's so tiny people don't know or notice*  
5            *do they? (E)*

6    However some others had not thought about what happened to the products following  
7    their use:

8            *Like dissolve, I didn't think that they stayed whole. (S)*

9

## 10    **Theme 2: Reactions**

### 11    **Question 3- What are your thoughts about these products now?**

12    The environmentalists were familiar with the concept of plastic microbeads but some of  
13    them were still surprised by the amount of plastic in each product:

14            *Oh my God that's the amount of granules in each of these. (E)*

15            *Oh my goodness. (E)*

16    Similarly the beauticians were very concerned and somewhat disturbed by what they had  
17    been shown.

18            *Is that how much plastic would be in one bottle? Oh my God that's like almost half of*  
19            *it. (B)*

20

21    The body language of participants also changed at this point. Having been sitting back in  
22    their chairs the majority sat forward and continued to pass round the microbeads to each  
23    other for the rest of the session:

24            *It's weird. (S)*

25            *I just don't think it's very good for your skin if you're putting, I don't know, just seems*  
26            *a bit fake. (S)*

27            *It's quite dangerous like for the like the world around us basically. (B)*

28            *I didn't really think about the fish when I was using the scrubs if I'm honest, I knew*  
29            *there was plastic in them but it didn't really come into my head. (S)*

30    Naturalness emerged as a major theme, as illustrated by the responses above that viewed  
31    the products containing microbeads as 'weird' and 'fake'.



1 One participant immediately decided she would change her behaviour towards using the  
2 cleansing products:

3 *Don't want to use it again. (S)*

4 Another participant voiced an emotional reaction:

5 *I have one at home, I feel really bad now. (S)*

6 However, some participants felt that microbeads in the sea were not a major cause of  
7 concern and would not necessarily change their behaviour:

8 *I think it does concern me a little bit but there's so many things that go into the sea I  
9 wouldn't really say it's the biggest concern, but it definitely is one. (S)*

10 *Well I wouldn't really say to you I'm not using them anymore but... (B)*

11 Participants sometimes spontaneously compared microplastics to other societal issues.  
12 Microbeads were seen as lower priority. One of the environmentalists commented:

13 *The thing is people, you know when you've got hundreds of thousands of Syrian  
14 refugees, this just seems a bit unimportant. Syria has taken massively, had taken  
15 people's eyes off other stuff for the time being hasn't it? (E)*

16 Others suggested that the issue lacks visibility and personal relevance and is also competing  
17 for attention with a number of other environmental issues:

18  
19 *I don't think people really care unless it affects them personally. (S)*

20 *Unless they can see it, cos as I say, if you just say there's stomachs of fish being filled  
21 it's just like oh ok, I know it's going to be gross but if you could put out all the pictures  
22 with the plastic bags and, like there was a turtle who had plastic bags in his stomach.  
23 (S)*

24 *.... it's kind of hard to inspire when you can't like show some poor bird or something,  
25 because you can't even see it, like if there was a rock pool, if you even poured that  
26 into a rock pool, you wouldn't even really see it in there, so it's kind of hard [...]  
27 there's so many environmental concerns right now that kind of, you know they are  
28 glaringly obvious but nothing is actually really getting done, we kind of get used to  
29 it... (E)*

30 When presented with the samples the participants began to question what effect  
31 microbeads have on fish and other aquatic life.

32 *Does it physically harm the fish? Obviously I know that it's in their stomachs, but does  
33 it like poison them or anything? (S)*

1           *Does it just fill their stomach so then they die cos they can't digest any nutrition from*  
2           *it? (S)*

3           *Yeah cos if it bioaccumulates in all the fish then that's quite a lot of plastic. (S)*

4 Students raised concerns particularly about eating seafood contaminated with microplastic  
5 particles and the potential consequences for human health:

6           *Get digested by animals. (S)*

7           *And then you eat the animals so then the plastic has been eaten. (S)*

8           *You're eating those. (S)*

9           *Cos you can't afford to eat plastic can you? (S)*

10 Similarly, the environmentalists also drew attention to what they saw as the potential  
11 consequences to human health:

12           *when we did this plastic conference last year, a PhD student he opened the whole*  
13           *conference talking about microplastics and sharing slides of the Zooplankton that*  
14           *were ingesting the microplastics, and you could see in their, you know they stopped*  
15           *feeding to their usual capacity because they thought their stomachs were full but it*  
16           *was actually these tiny particles of plastic, so that was a moment for me of just*  
17           *thinking that Zooplankton, that's the beginning of the food chain. (E)*

18 However, none of the beauticians spontaneously mentioned concerns over microplastics  
19 potentially entering the food chain.

20

### 21 **Theme 3: Ideas for change**

#### 22 **Question 4 - Now you know about microbeads what do you think can be done to** 23 **reduce/eliminate their use?**

24 The responses to this question were wide ranging. Individuals decided you can use  
25 alternatives:

26           *Yeah but I'll just go back to face washes that don't have the plastic in them, you don't*  
27           *need the scrub. (S)*

28           *I've used one that's got like natural scrub in it but I can't remember what it was,*  
29           *[product name omitted], like apricot scrub. (S)*

30           *I've used one with salt in before, sea salt. (S)*

1 Ideas were expressed about what might and might not work as methods of raising  
2 awareness amongst peers:

3 *Like try and raise awareness and get it out through magazines and stuff, especially*  
4 *like gossip ones because you find it's usually a lot of people that read gossip*  
5 *magazines who often use quite a lot of beauty stuff. (B)*

6 *blogs as well, there are lots of beauty blogs. (B)*

7 However, other participants said that it was easy to ignore content on social media:

8 *I think it's been in the media quite a bit, but you need to be sort of attuned to it to be*  
9 *reading those stories really. (S)*

10

11 Although one of the beauticians did feel that using the advertising space on Facebook might  
12 have value:

13 *I usually use like Facebook and stuff, and when things pop up on there I like read it*  
14 *and stuff. (B)*

15

16 In terms of personal responsibility, the beautician students believed that they were in the  
17 front line in terms of educating the public. They felt their opinions were listened to by their  
18 clients asking advice so they could pass on the knowledge they had acquired

19 *Just kind of make it more aware and stuff every time you use it and like if you hear*  
20 *people using it like not shove it down their throat, but just make them aware of it*  
21 *because obviously people don't like it when people are forceful with stuff, so if you*  
22 *just 'oh did you know they've got plastic in them?' then maybe that would help. (B)*

23 By this stage in the focus group the participants were very enthusiastic about thinking of  
24 ways to pass on the message about microbead use to the wider population and had further  
25 ideas for media to reach key target groups.

26 As the discussion developed some of the problems associated with raising awareness were  
27 considered. The comparison with the smoking cessation programme (a major public health  
28 campaign in various countries that introduced warning labels on cigarette packets) is  
29 valuable as it potentially mirrors some of the barriers that might occur when trying to elicit  
30 behaviour change in people who are committed to using a particular product. Labelling was  
31 suggested as a way forward:

32 *yeah if you educate people they're more likely to do it cos like you said when it's*  
33 *scary people are going to choose not to, like you can kind of choose to ignore it, or if*  
34 *they're so, like people still smoke even though those pictures are on it, and that's*  
35 *because they become like habituated to it and they're just like oh... (S)*

1            *Could pop a symbol on the actual product itself, you know it was causing harm to the*  
2            *fish and other animals. (S)*

3 Another potential barrier that was highlighted was the financial cost of the facial scrub  
4 products and their association with being “environmentally friendly.” For example:

5            *I think as well just from what I’ve been looking round at, there is a huge price tag on*  
6            *it being environmentally friendly and good for the environment, that seems to give*  
7            *them the right to up the price, double it almost, they’re very expensive. (S)*

8 The environmentalists commented on the perception of it being a relatively small problem.  
9 One recounted that it was only when they joined with other like-minded individuals that the  
10 issue became more real and visible to them, and they felt empowered to act:

11            *I just didn’t think about where it went really, and so I think it’s only since starting up*  
12            *the group and suddenly, you know, you create a sort of world for yourself on*  
13            *Facebook where you get into contact with all these organisations internationally*  
14            *doing things and you start to realise how huge the problem is... and this is like the*  
15            *elephant in the room because it’s so tiny people don’t notice it do they? (E)*

16 There was a considerable amount of cynicism expressed about industry taking voluntary  
17 action. For example, one of the beautician trainees commented:

18            *I mean the companies aren’t ever going to change their ingredients. (B)*

19 The environmentalists were very much in favour of introducing ban on products containing  
20 microbeads. They saw the role of NGOs as being important and they thought government  
21 should play more of a role in forcing industry to act:

22            *I know the 5 Gyres Foundation are doing a lot of work on it and they’ve been really*  
23            *instrumental I think in getting a lot of the big companies to commit to phasing them*  
24            *out, that’s internationally. (E)*

25            *I think it’s industry and I think government... needs to force the industry and of*  
26            *course public awareness is important but that will just take forever. (E)*

27

## 28 **5. Discussion**

29 The focus group discussions revealed that all participants were familiar with the personal  
30 care products and some, for example the environmentalists, knew they contained plastics  
31 and were aware they had used them. The majority of participants knew how they worked.  
32 In terms of the ingredients, excluding the environmentalists, some participants had either  
33 never thought about the contents of the scrubs or assumed the ingredients were natural  
34 (e.g., sugar, nuts or salt). Most participants had some idea about the fact that post use the

1 contents of the product would be washed away into the sewers and then 'into the ocean'.  
2 The environmentalists described how shocked they had been when they first discovered so  
3 much plastic on the beaches close to their home and connected this to the issue of  
4 microplastics. However some others had not thought about what happened to the products  
5 following their use. The issue lacked visibility and immediacy for the beauticians and  
6 students, some of whom had previously not reflected on the issue and had assumed that  
7 the particles simply disintegrated when they were washed down the drain.

8 This lack of awareness among students and beautician trainees, who tend to be consumers  
9 of such personal care products, is supported by the findings of recent survey research  
10 (Chang, 2015; Greenpeace, 2016). However, when the participants were shown the amount  
11 of microplastics in the products they all exhibited considerable surprise, including the  
12 environmentalist group. On seeing the concentrations of microbeads participants expressed  
13 shock and concern and said that they would change their behaviour. They reacted with  
14 disbelief and perceived it as 'weird', and the inclusion of this ingredient was viewed as  
15 unnatural and unnecessary. Regardless of their prior experience, similar themes emerged  
16 after showing the contents of the products to them. Physically demonstrating the amount  
17 of microplastics in the sample products had an instant impact and led them to start  
18 questioning the impacts. 'Naturalness' emerged as a major theme in our data. As the  
19 quotations illustrate, there was a spontaneous revulsion against the use of microplastics in  
20 personal care products. The degree to which an issue evokes an emotional response has  
21 been shown to be closely related to judgements about acceptability and risk (Pidgeon et al.,  
22 2012; Rakow et al., 2015; Slovic, 2010). Regardless of the extent of harm, the focus group  
23 participants did not like the idea of using microplastics in personal care products when  
24 shown actual samples.

25 We know from research in other science communication areas, from cloning to genetic  
26 modification to geoengineering, that if a risk is perceived as unnatural then it is less likely to  
27 be viewed as acceptable (Durant et al., 1998; Pidgeon et al., 2012). Also there is special  
28 sensitivity in relation to food issues (Allan et al., 2010). Among our participants, concerns  
29 were raised particularly about eating seafood contaminated with microplastic particles and  
30 the potential consequences for human health. Laboratory studies have begun to show that  
31 microplastics can be transferred in the food chain but thus far there are no data  
32 demonstrating their bioaccumulation and considerable uncertainty exists (Duis & Coors,  
33 2016). This was mainly questioned by the students and environmentalists, with the  
34 beauticians not spontaneously mentioning concerns over microplastics potentially entering  
35 the food chain. The beautician trainees were also generally less likely to express overall  
36 concern about the issues.

37 Another factor shown to influence people's assessment of the urgency of risk issues is their  
38 general visibility among a range of competing threats (Anderson et al., 2009; Pahl et al.  
39 2016; Sheppard, 2012). Microbeads were seen as competing for attention with a number of

1 other environmental and societal issues and relatively low down the list of the public's  
2 priorities. This is in line with other research that has shown people have a limited 'pool of  
3 worry' (e.g., Centre for Research on Environmental Decisions, 2009). Another barrier  
4 mentioned by the students was the price of using alternative products. As illustrated by  
5 quotations, the environmentalists were strongly in favour of placing a ban on products  
6 containing microbeads and they saw NGOs as highly instrumental in bringing about pressure  
7 on industry to start phasing them out. They thought government should play a stronger role  
8 in forcing industry to take action.

9 Likewise the beauticians expressed cynicism about industry taking voluntary action.  
10 Informing people about the problem, solutions, and clearer labelling was seen as more  
11 effective. The beautician trainees were very aware that they were in the front line in terms  
12 of educating the public. They felt their opinions were listened to by their clients asking  
13 advice so they could pass on the knowledge they had acquired. However, there was some  
14 scepticism expressed in all the focus groups that simply educating the public was insufficient  
15 since there are so many other issues competing for their attention.

16 The amount of plastic used in microbeads may only represent a small proportion of all  
17 marine litter (Sherrington et al., 2016); however this should not be seen as a reason not to  
18 take action either in the form of legislation or a voluntary phase out. Around 680 tonnes of  
19 microbeads are used annually in the UK alone. This is considerably more than the total  
20 weight of litter removed from shorelines annually in voluntary beach cleans by Marine  
21 Conservation Society (Environmental Audit Committee, 2016). So it is evident that the  
22 quantity of plastic used as microbeads is not trivial. Recognition that microbeads are only a  
23 relatively small contribution to the overall input of litter to the oceans merely underscores  
24 the scale of the wider problem at hand and hence the need to take action to reduce or  
25 eliminate avoidable sources of plastic to the environment wherever this is feasible. In terms  
26 of limitations it should be borne in mind that the focus group participants were mainly  
27 female and under the age of 25. Whilst this demographic is especially relevant to examine  
28 as they are the heaviest consumers of personal care products, the findings may not be  
29 comparable to other demographic groups. For example, previous survey research suggests  
30 that younger people tend to have a greater awareness compared to the over 55s that  
31 microbeads are used in personal care products (Greenpeace, 2016), and are also more  
32 exposed to digital media than older demographics (Anderson, 2014). The researchers had  
33 also been concerned about the potential for influencing the participants' awareness of the  
34 plastic microbeads issue because a week prior to the focus groups there had been news  
35 coverage in local media (television and newspaper). However, none of the participants were  
36 aware of this coverage. Indeed, the findings suggest that the focus group participants,  
37 especially the students and beautician trainees, rarely accessed traditional news media  
38 sites. Predominantly, they gained their information from online blogs, and social media sites  
39 such as Facebook and Twitter. Moreover, social media sites are increasingly personalizing  
40 news content and adverts, so the kind of information that the different groups will have

1 been exposed to is likely to have been very different (Anderson, 2014). With an increasingly  
2 fragmented media environment, this poses a major challenge for communicators and a  
3 danger that “... as audiences fragment they will tend to largely encounter information that  
4 reinforces their prior views” (Anderson, 2014: 40).

5

## 6 **6. Implications and Conclusion**

7 The findings of this study have important implications for scientists, policy makers and  
8 industry. General expressions of revulsion are clearly of relevance to manufacturers in  
9 considering the marketability of their products and potential for negative connotations  
10 among consumers, whether they are concerned mainly about their own health and  
11 exposure to plastics or about wildlife and the environment. Industry has made voluntary  
12 commitments over the last few years yet these have been criticised for not being  
13 comprehensive enough (e.g., Carrington, 2016). If voluntary efforts are not convincing, this  
14 risks further undermining trust in industry, which could become a major issue in this  
15 sensitive context of personal care products. This study clearly illustrates levels of concern  
16 regarding the use of microbeads in personal care products, coupled with a lack of perceived  
17 necessity. This leaves us in an enviable position. Effecting change for environmental issues  
18 that are perceived to be undesirable and unnecessary is obviously easier than for issues high  
19 in benefit and/or necessity (e.g., air travel). In addition to the voluntary efforts mentioned  
20 above, there are other options. If microbead content were labelled very clearly (as  
21 suggested by our participants) we would expect a fairly strong consumer response, given  
22 the strength of feeling. Labelling and more powerful forms of visualisation have been used  
23 in other behaviour change contexts such as smoking. Alternatively, a ban has been  
24 suggested in many countries and our participants here, including future experts in skincare  
25 and beauty. This suggests a ban would be acceptable to consumers. Because of the  
26 complexity of plastics use in products, it is vital that such policy be developed in close  
27 consultation with natural and social scientists (Rochman et al., 2016). In sum, a range of  
28 measures is available to address the noxious issue of microbeads in personal care products.  
29 While we progress with these measures we must also keep in mind the bigger picture of  
30 plastics use and disposal in modern society. Microbeads are but one facet of this, and even  
31 if these are phased out, marine plastics, primary and secondary microplastics, will continue  
32 to enter and exist in the world’s oceans.

33

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3

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