Original Article

The domestication of an everyday health technology: A case study of electric toothbrushes

Simon Carter^{a,*}, Judith Green^b and Nicki Thorogood^b

^aDepartment of Sociology, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK.

E-mail: simon.carter@open.ac.uk

^bLondon School of Hygiene & Tropical Medicine, Keppel Street, London WC1E 7HT, UK.

E-mails: Judy.Green@lshtm.ac.uk; Nicki.Thorogood@lshtm.ac.uk

*Corresponding author.

Abstract Using the electric toothbrush as an example, this article examines the growing acceptability of domestic health technologies that blur the traditional boundaries between health, aesthetics and consumption. By using empirical material from individual and household interviews about people's oral health practices, this research explores the relationships between an everyday artefact, its users and their environments. It investigates the ways in which oral health technologies do, or do not, become domesticated in the home environment. We conclude that the domestication of oral health technologies is not inevitable, with the electric toothbrush often becoming an 'unstable object' in the domestic setting.

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Introduction

Using the electric toothbrush as an example, this article examines the growing acceptability of domestic health technologies that blur the traditional boundaries between health, aesthetics and consumption. The maintenance of health is no longer just about the avoidance of disease, but increasingly the presentation of an ideal self. However, domestic health technologies, those artefacts that are placed in the home and related to physical welfare, are not neutral in the process of presenting an ideal self: they must be recruited in particular ways within particular domestic and social environments, and in doing so have impacts on

those environments. This article uses empirical material from individual and household interviews about people's use of electric toothbrushes as a case study to explore the relationships between an everyday artefact, its users and their environments. It explores the ways in which electric toothbrushes do, or do not, become domesticated in the home environment.

Today, supermarkets and pharmacies carry an ever-growing array of toothpastes, toothgels, mouthwashes, flosses and dental brushing devices (a survey of toothbrush designs between 1961 and 1998 found over 3000 patents – McGrath and Travers, 1998). One of these products is the electric toothbrush, commonly available to the consumer in chemists, electrical goods outlets and supermarkets. The electric toothbrush has been available since the early 1960s but remained a somewhat specialist product until the end of the last century since when, just as with other oral health care products, the diversity of products available has proliferated (Jardim *et al*, 2009; Wong, 2012).

The increasing variety and range of electric toothbrushes reflects changes in patterns of oral health over the last two decades, with a far greater proportion of young adults in western countries having sound teeth than earlier (Perri *et al*, 1996; Whelton, 2004). Such improvements in oral health have switched the emphasis in the management of oral care away from the restoration of damage and towards the prevention of dental disease through the application of novel technologies. This change is likely to increase the significance of oral health technologies available to the consumer in the immediate future.

However, the increasing availability and use of artefacts such as electric toothbrushes is not just an outcome of changing patterns of dental disease. It also reflects the changing relationships of health, identity and consumerism in late modern society, in which health promotion has become increasingly intertwined with consumption and identity (Bunton and Burrows, 1995). Like other areas of health promotion, dental health utilises the techniques of marketing to promote particular behaviours and commodities, to the healthy as well as 'the sick'. More significantly, for those that have the material resources, such health-related commodities became a crucial cultural resource for the construction of identity. These processes are particularly evident in dental care, with many emerging oral technologies (including toothpastes) stressing cosmetic benefits rather than simply health improvements. Such cosmetic effects are not trivial, given the ways in which, for instance, 'rotten teeth' have become a marker of low status in a culture where good teeth have become a symbol of middle-class adequacy (Starr Sered and Fernandopulle, 2005). To separate out a domain of 'health' from that of aesthetics or consumer, culture becomes ever more complex, as the patient/consumer accesses an increasing array of knowledge sources to make choices about *what* and *how* to consume, not only to prevent disease, but also to produce and display valued social identities. As Fox and colleagues (Fox *et al*,

2005; Fox and Ward, 2006) have argued, this proliferation of knowledge sources has potentially radical implications for traditional relationships between 'patients' and biomedical expertise. Suggesting that health and identity are 'mutually constitutive within contexts of relations with the material world, culture and psychosocial engagements', Fox and Ward (2006, p. 462) take the examples of Xenical, a weight loss drug, and Viagra to show how health identities may either be framed within biomedical discourses or (in the case of Viagra) as more or less 'independent consumers', who have little reliance on biomedical expertise.

Unlike prescribable pharmaceuticals, the technologies required for oral health practices have long been directly marketed to consumers, with marketing expertise mobilised to identify a range of aesthetic and social as well as 'health' features that might attract potential customers. Wong (2012), for instance, details the importance of focus group data in the design of a market leader of the late 1980s, described as a 'distinctive, attractive, expensive-looking toothbrush' (Wong, 2012, p. 32) as well as one which cleaned without damaging gums. That dental technologies are so prominent at this nexus of health, aesthetics and consumer identity is perhaps not surprising given the social importance of the mouth, which 'holds a peculiarly symbolic position, being the space through which things pass both into and out of bodies' (Thorogood, 2000, p. 167). In this sense, the mouth has been an object of anthropological investigation as a key boundary between the self and society, or the body and the outside, and thus a potentially risky site of transfer (Nettleton, 1988). This boundary is not a simple border between the individual body and that which lies outside, but one that is negotiated to include or exclude particular social bodies that are more or less 'inside'. The 'mouth rules' which Thorogood (2000) analyses are those conventions and taboos by which social distinctions (family, intimates) are marked and constituted by appropriate and inappropriate crossings between the mouths of individuals. Apart from Thorogood's analysis of 'mouth rules' and the work of Nettleton (1991, 1992) on dental discourses and governance, there has been relatively little sociological work on dental health in general (Exley, 2009), and even less on dental technologies. Seemingly trivial artefacts such as toothbrushes are an essential element of this new relationship between the body and self, in which technologies carry meanings that are not restricted to those of health benefits. Located at the border of the traditional domains of health, cosmetics and consumer identity, the electric toothbrush symbolises an increasing commodification of the body that offers the user the prospect of purchasing the 'perfect mouth'. Analytically, such technologies thus represent a neat nexus composing identity, the body, consumption and technology.

There is nothing inevitable about the current widespread use and increasing availability of the electric toothbrush. Early innovations were 'bulky, inefficient and technically unreliable' (Mielczarek *et al*, 2012), with poor take-up. A closer

examination of the ways in which these artefacts are used in practice, or how they may (or may not) become embedded in everyday domestic domains will help shed light on how and why some artefacts do become part of a domestic environment while others do not. As Warde (2005) reminds us, the connection here between consumption and practice is crucial, as 'consumption is not itself a practice but is, rather, a moment in almost every practice' (p. 137). To be an effective practitioner of good oral hygiene entails the consumption of goods (for example, brushes and toothpastes) and services (for example, dentistry). This approach provides a neat contrast to what Warde (2005) describes as 'expressive accounts of consumption', that concentrate on the symbolic and meaningful aspects of commodities, whereas much consumption is still 'governed by considerations of efficiency and effectiveness' (p. 147). An account that follows users and their practices would not fall prey to favouring one position over the other.

One way of following both the social and material practices of users surrounding the mouth, the electric toothbrush and the domestic environment comes from science and technology studies (STS). A primary focus of STS is the relationship between humans and technological objects; in our case between mouths and toothbrushes. STS is therefore well suited to describing the processes whereby culture and material artefacts interact and shape one another. STS firmly inhabits the ground in the middle of a continuum between the social and the technological, and rather than privileging one or the other it instead emphasises the *co-production* of how the social and the technical 'shape one another in complex knots' (Michael, 2000, p. 5). A related advantage of STS is the 'relational materiality' of the approach – the insight that user identity is produced because of relationships with other entities (both humans and non-human technical artefacts). In this way, STS seeks to show how successful technologies depend on the production of stable networks of both social and material relations (Callon, 1987). This approach introduces the idea of action being distributed across networks of human and non-human entities.

Within this approach, the power to produce a healthy mouth is not understood as residing inside the skills of the individual toothbrush user or within the particular toothbrush they use, but as something that emerges out of the networks or associations with which each is involved. Devices can certainly shape action by anticipating human and non-human interaction, in a process that Latour calls prescription: 'what a device allows or forbids ... that it anticipates; it is the morality of a setting both negative (what it proscribes) and positive (what it permits)' (Akrich and Latour, 1992, p. 261). Thus, some toothbrushes incorporate designs to prevent users from pressing too hard on gums or timers to ensure brushing is carried for the prescribed two minutes. In addition, each actant has underlying 'sub-programs' for action: the precise things that it can do when introduced to a wider network of actants (Latour, 1999). For example, users may

employ toothbrushes or toothpastes because they wish to improve oral health or because of cosmetic improvements. However, for a domestic artefact to become, as Shove and Southerton (2000) say, 'normal' necessitates a bidirectional process in which the artefact responds 'to their surroundings and at the same time impose something of their own script' (p. 315).

In practice, however, technologies cannot determine action in any simplistic way. It may be that neither the 'right brush' nor the 'right skills' produce 'good' oral health because new technologies (such as electric toothbrushes), with their various potential sub-programs, are inserted into an environment composed of existing relationships between actants, all with their own sub-programs. The complexity of the real-world settings means that, when combined, actants translate each other's sub-programs into actions. These translations performed by each actor's sub-program on the other's sub-program potentially create new identities that could not be envisaged at the design stage.

Technology, Oral Health and Everyday Life

These issues are highly pertinent when considering the incorporation of technology into domestic domains and everyday life. Mundane technologies like those associated with oral health are often overlooked in contemporary debates about technology – they tend to be rendered invisible through being perceived not as addressing new problems but as improving on existing solutions (Michael, 1997). Thus, users are familiar with the idea of brushing teeth and the electric toothbrush may be seen as unremarkable because it merely produces an incremental change to existing oral health practice. This means that it is important to study the detailed practices through which such technologies find their way into domestic domains – how they are defined and situated in domestic environments 'in a way which may imply a redefinition of one's own routines and practices' (Lie and Sørensen, 1996, p. 9). When people acquire new technological artefacts, these undergo a process of *domestication* through which they are incorporated into everyday life. Thus, any new piece of technology introduced into the domestic environment will require new local routines to guide its use and that any existing scripts of practice be translated/transformed (also see Oudshoorn and Pinch, 2003).

The term domestication was itself first used (Silverstone *et al*, 1992) to emphasise that technological artefacts are rarely just acquired and then used unproblematically. For any technological artefact to be integrated into a new environment (for example, the home, workplace or leisure activities), it first has to be 'tamed' and 'cultivated' with transformations to accommodate this consolidation. This domestication involves symbolic work (the creation of meaning), cognitive work (learning) and practical work (for example, changing

patterns of use and daily routines). The idea of domesticating technologies was further developed by Silverstone and colleagues (see also Aune, 1996) who usefully split the process of domestication into four partial phases or processes, namely appropriation, objectification, incorporation and conversion (Silverstone *et al*, 1992). In the context of considering an artefact being 'domesticated', we can think of these phases as follows: *appropriation* is the work that is done to move an artefact from being merely a potential commodity to one that is actually taken possession of by an individual or household – when it is made physically and symbolically accessible; *objectification* relates to how an artefact is given a place and role within an aesthetic environment of the household; *incorporation* is the ways in which an artefact is used and fits into the temporal routines of household life; and *conversion* is the process whereby the users within the household may come to define the relationship between the artefact and the wider environment and social world.

To explore this process with an everyday health technology, we draw on users' and non-users' accounts of electric toothbrushes. Given that we aimed to explore both the social meanings of electric toothbrushes and how they become embedded (or not) in domestic settings, we chose a mixture of individual and household interviews. In this context, household interviews have the potential to produce invaluable data on the ways in which actors, new technologies and existing environments interrelate because data is gathered from all the members of the household simultaneously (for example, family members or housemates) in the domestic setting in which the technology is used. Conducting household interviews also draws on some of the advantages of 'natural' group interviews, in that the researcher has access to the ways in which people might interact in their everyday lives, with those who are a real part of their social network, rather than the artificial groups often created for focus group interviews (Kitzinger, 1994; Green and Hart, 1999). In this case, household interviews provided an opportunity for us to access both the ways in which technologies are used in domestic settings, and also observational data on how oral health technologies relate to existing domestic and household technology. Individual interviews allowed the opportunity to explore more sensitive areas, such as issues to do with 'bad breath'.

A key part of our data gathering involved 'household mapping' where respondents were invited to show the interviewer their oral health products and indicate their locations of use. Six household interviews (each comprising between two and four respondents) and eight individual interviews were conducted. The aim of sampling was to include respondents of different households some of whom used electric toothbrushes and some of whom had rejected these artefacts.

All interviews were recorded and transcribed. These transcripts were analysed using a mix of inductive coding (drawing on grounded theory traditions) and

deductive conceptual themes relating to the processes of domestication which we use to frame this article. At a practical level, the analysis of the data collected involved scrutiny of the interview transcripts and joint meetings to discuss themes. We used a variant of discourse analysis (Potter and Wetherell, 1987; Fairclough, 1995) to interpret participants' talk. In particular, we used a 'representational' approach as a means of accessing contradictory or ambiguous concepts, statements, images and explanations and of unpicking the construction of identities. This methodology attempts to systematically explore relationships between practices, events and wider social structures while taking account of the capacities of particular actants. For our purposes, this approach has the advantage of allowing a sensitivity to the specific substance of words and expressions in use and how they relate to the material objects and practices that we focus on here. Needless to say, we do not presume our interpretations to be exhaustive of the data: they are highly circumscribed, but are offered here as one way of elucidating the relationships between artefacts, environments and users. All data have been anonymised, with identifying names and locations changed to pseudonyms, and the tags on extracts identify whether the source is a household (H) or individual (I) interview.¹

The Electric Toothbrush User in Domestic Domains

In this article, we consider how the electric toothbrush was incorporated in domestic domains using the four phases of the domestication process suggested above. While we will return to a broader discussion of the relationship between everyday technologies and their environments in our conclusions, we will for the moment use the phases of appropriation, objectification, incorporation and conversion to structure our discussion for two reasons. First, the domestication approach meets users on their own ground by stressing the complexity of the local environments. Second, such approaches allow the consideration of a wide range of economic, cultural and social relations.

Appropriation

Appropriation at its simplest occurs when a device is purchased and users take it home. However, in practice there was a large degree of 'overlap' between the partial processes associated with appropriation and some of the later phases. Indeed, many of the respondents reported similar issues while engaging with different stages of the domestication process. In making evaluation and justification judgements about oral health devices, respondents continued to use the same criteria both before acquiring the products, and after they had gained

practical experience of using the devices. For the electric toothbrush to become physically and symbolically accessible, and thus appropriated within a household, two broad tensions had to be resolved. The first of these revolved around the relative necessity or superficiality of the artefact. The second was the meshing of technical information (neutral evidence) versus experience (embodied and subjective evidence).

Superficiality versus necessity

Respondents often began by addressing the question of whether particular oral health technologies were *necessary* tools for good oral health. Of course, behind the apparent simplicity of this core question lay a series of supplementary issues. For example, one insight that STS has provided has been that technologies often contain idealised versions of the user's identity (Prout, 1996). The desirability of the device will depend on the extent to which a user is able to identify with this idealised version of self. Some respondents explicitly tied the process of appropriation to an engagement with an idealised identity contained in the device. Here, two respondents from a household interview discuss the ways in which an electric toothbrush imposes a positive 'health promoting' identity on the user:

Billy: ... somehow you think, well, you've got an electric toothbrush, so you ... make an effort with your teeth ... so you think 'Oh yeah, well ... since you're supposed to brush them for really long'.... I pay a bit more attention since I've got the electric toothbrush.

Pauline: Because you feel you should, it kind of goes with the product?

Billy: Well ... yeah, that's true, it kind of goes with it, because ... I mean, these kind of products have a bit of a ... health connotation, more than the normal toothbrush would. It's kind of saying, 'Well, yeah, I do care about my teeth'. [HI-3]

Once the idea of health had been attributed to the electric toothbrush, respondents could reposition the artefact as a necessity rather than something superfluous. However, this positioning was not inevitable; some respondents saw the electric toothbrush as an unnecessary device because it problematised a simple practice with an overly complex technical solution. Typically, such respondents distanced themselves from the idealised electric toothbrush user by using humour and ridicule:

Neil: They might be really cheap now ... more reasonably priced now ... But, to me, it doesn't ... it doesn't seem much point because I can, you know, go like that ... [shaking arm up and down] You know, are you bothered enough to be able to do that, so it's slightly pointless to me. [II-3]

In a similar vein, Phil felt that people with electric toothbrushes were ‘those with too much time on their hands’. He also fails to recognise the identity implicit within the electric toothbrush, in this case by invoking the concept of ‘the natural’ as a referent of health:

I think it’s ... a bit of a knee-jerk reaction. We do not let *nature* have a say. We seem to throw electronic technology at it, and then come away saying, ‘Oh, we’re healthy’. I don’t think necessarily we are. I think we’re almost deluding ourselves [II-2]

Superficiality was also constituted through references to ‘frivolous’ consumerism, which sat uneasily with valued aspects of users’ identities. Here, for instance, (nationalised) identities of frugal understatement or adult sensibleness are invoked in the implicit contrasts between the (non-user) self and the perception of a more frivolous and conspicuous American consumer:

Sharon: ... my main memory of electric toothbrush as a group of consumer items was that when I was a child they were something that Americans had and English people didn’t

Grant: Yes that’s right ... it was something that did it for you ... it was a bit of ... a bit of a frippery ... it was a bit of a consumer thing if you wanted to show that you had every gadget around. [HI-4]

For such respondents, the appropriation process for this particular technology was never initialised, as the gap between the idealised identity contained in the technology and their own identity was too great: the devices were beyond domestication.

In the face of such potential undermining of ‘necessity’, an important legitimating discursive resource was reference to the expertise of health professionals. The risks to a ‘moral’ self implied by the superficial, or the overly consumerist, could be offset if a legitimate claim to medical necessity could be made. Pat, for instance, explicitly relates her initial purchase of an electric toothbrush to a negative encounter with a dental hygienist:

Well, last time ... I was totally humiliated by the hygienist – ‘you must do better’ [impersonates stern person wagging finger] and she said, they’re really not expensive ... [II-1]

Sanctioning from an expert does useful moral work of rendering the device ‘necessary’ for health, rather than as a potentially superficial consumer good. However, such sanctioning from an expert often, as we shall see later, becomes the starting point for a more ‘experienced-based’ lay expertise (Rip, 2003). In analysing the household discussions, it becomes clear how such sanctioning can

be used overtly as part of negotiation within a household. Here, for instance, Steve uses a dentist's legitimating remarks to deflect the possibility of his purchase signifying merely a (perhaps gendered) desire for another 'gadget':

I: Can you remember who bought an electric toothbrush first and why?

Jenny: Steve [partner] bought our first one but he is into gadgets so that's typical.

Steve: Yeah ... I had been at the dentist and he was dictating notes to the nurse while examining my mouth ... said something about my gums being discoloured and soft [HI-1]

This sanctioning role of biomedical expertise was particularly powerful as a moral agent in the governance of children's mouths. Encounters with dental professionals were used to reinforce positive parental identities, with equivalences established between parents' roles as responsible for the production of hygienic teeth in their children, and the necessity of having an artefact to aid with this process. Here Ian makes a neat link between the social and moral influence of the dentist and his own individual reification of technical solutions to the problems of everyday life:

Ian: A couple of years ago the dentist really went to town on us ... he saw three kids and said that none of them are really cleaning their teeth very well. He said get some disclosing tablets

Susie: But we would not repeat that regularly because they end up with really red mouths that are very messy.

Ian: Like vampire children.

Susie: But it was partly as a result of that that we got the electric toothbrush.

Ian: I had thought about getting one for a long time ... they are probably much better at cleaning. [HI-2]

Technical information versus experience

However, professional (biomedical) expertise alone was not sufficient to produce the electric toothbrush as a necessity. Those who did cite professional legitimization for the purchase still faced challenges with acquiring embodied skills of use. The appropriation of the electric toothbrush often incorporated a tension between needing new technical information and drawing on previous embodied performances of oral care. Hence, several respondents mentioned that the electric toothbrush could not be simply bought and used – there was an extensive process of users having to do 'domestication' work around the practices of oral

care both before and after purchases. Some of this work was related to accessing consumer, rather than purely health or medical information, as Billy, a user with no previous expertise, describes:

Billy: ... But the problem is ... it's difficult to compare. This is the thing, you get all these different types of electric toothbrushes, and it's kind of difficult to know whether an expensive one would be better than a cheap one, or that such and such a system is better than such a system [HI-3]

Although encounters with dental professionals might prompt respondents to purchase an electric toothbrush, or at least be used to legitimate such purchases, dental professionals emerge as less-than-useful informants on which device to buy, or even the criteria on which one might make a decision. Indeed, several respondents noted that they were often unable to find credible purchasing information that could be seen as trustworthy sources of information. Despite, for instance, a routine disclaimer that 'I tend not to believe the advertising' (II-4), Ricky goes on to suggest the kinds of information which would inform such a decision, and the limits he imagines for the case of electric toothbrushes:

Well, when I normally buy things, things ... you know, like a TV or a video, or something that I know I have to live with, use every day, and I want the best, I tend to go through the *Which?* Reports, but I don't know if the *Which?* Reports actually do electric toothbrushes Otherwise I'd have a look at the advertising blurb on the back of the boxes of toothbrushes. (II-4)

Beyond the distinction between types of information sought (health advice on the 'necessity of an electric toothbrush' versus consumer advice on 'which electric toothbrush'), this information gap also points to something of a paradox for users. Brushing one's teeth is primarily an embodied practice involving a complex interaction between environments, mouths, brushes and techniques. On the one hand, in order to operationalise the appropriation process, users needed knowledge about a diverse and confusing range of devices. On the other, the only way to gain knowledge and experience of these various artefacts was to use them and gain lay expertise – simple abstract knowledge was not sufficient to guide the appropriation. Thus, as Pauline and Billy eloquently note, understanding electric toothbrushes first required an enculturation process, in which (in an analogy with mobile phones) previously unrecognised needs might be elicited through use:

Billy: ... most of the problem of these electric toothbrushes is, you can't really work it out by just thinking about it, or looking about it, whether something would be good or not, because you're ... coming from the,

manual toothbrush thing ... that's where it stops, you know. Whether it's doing it faster than the other, whether it's got two speeds, or whether it's got a timer and everything, is just a bit too much to take in

I: Do those things really matter that much?

Billy: Well, I don't ... the problem is, maybe they do ... I don't think you can kind of work it out very easily

Pauline: Yeah. Or like mobile phones.

Billy: Mobile phones or something like that, you know, they have all these options.

Pauline: You think, 'Why would I possibly need that?' [HI-3]

Objectification

We here refer to the objectification of the electric toothbrush as a manifestation of the practical and functional aspects of the device as compared with its aesthetic values. This was reflected in respondents' talk about balancing the positioning of the device in the domestic environment against the aesthetics of the artefact. One key issue here concerned the rechargeable electric toothbrushes and the absence of electrical outlets in many European bathrooms. Here we can begin to appreciate how issues arose about the everyday positioning of this artefact and aesthetic questions about the electric toothbrushes acceptability in various micro-environments. Thus, for some respondents, the mere presence of an electrical device was not welcomed. Pat kept her electric toothbrush away from the main bathroom because 'it has to be pretty tidy... and I don't want wires hanging off all over the place' [II-1]. For Vanessa, associations of the 'danger' of mixing water and electricity accentuated aesthetic considerations, disrupting the smooth path of objectification of the device, thus slowing its adoption:

Vanessa: ... Anyway, now I use it all the time. Twice a day! But I still worry about getting electrocuted ... You know you're not supposed to mix water and electricity – that's drummed into you, even I know that. So the big problem is, I wait for it to stop dripping, I wait for all the drips to go, before putting it back in its little stand. And then I forget to put it back, so it keeps running down. [II-8]

Even when an electrical outlet was available in the bathroom, households faced practical problems around positioning. In the following extract, the two

respondents discuss their usage of electric toothbrushes. Sharon used an electric toothbrush and Grant a manual toothbrush but showed interest in purchasing an electric toothbrush. However, this couple were not prepared to share an electric toothbrush (even with different heads):

I: So would you be persuaded to buy another electric toothbrush?

Grant: The limiting step right now is somewhere to plug it in ... when we did try sharing an electric toothbrush ... we had separate heads which is a real pain ... and we've only got one charging socket ... in fact we are planning to put in another charging socket but we have not got round to it

Sharon: ... we would share the charging unit but that's as far as we would go [HI-4]

Here, objectification meshes uneasily with the management of appropriate levels of intimacy. This echoes the findings of Thorogood's (2000) analysis of 'mouth rules' that the space classified as 'inside' (a mouth) is where intimacy is often produced. As such, detritus from the mouth is deemed private (the inside coming out and making it 'matter out of place' (Douglas, 1966)), and cleaning one's teeth (especially 'spitting out') becomes subject to rules of intimacy. However, here we see that levels of intimacy were also constituted in part through discourses of aesthetics, with comments around how people 'look' when in the act of toothbrushing, as well as around the pollution risks (flecks of toothpaste on bathroom mirrors, floors, the person) and the potential for hygiene breaches (germs crossing mouths, or arising from poorly cleaned devices). The social acceptability of using an electric toothbrush around the house was framed primarily by respondents in terms of the aesthetics of one's appearance while using the device. Indeed, discussions within households about the locations that were, or which should be, used to brush one's teeth were common:

Ian: We mainly use the bathroom – when I was a kid I always used to wander around brushing my teeth but now I tell my kids not to do it.

I: Why?

Ian: In case they drop toothpaste on the carpet.

Susie: They don't take any notice though! I wander around sometimes.

Ian: Yeah – I don't mind wandering around ... I used to wander more with a hand toothbrush. You feel like a bit of a prat wandering around with an electric toothbrush.

I: Why?

Susie: Well we were once walking through the park ... and there was a jogger doing some exercise in a sports outfit cleaning his teeth with an electric toothbrush and we thought it was very anti-social. [laughter]

Ian: Yeah – it was very obviously someone doing some quite personal hygiene in a public place and we thought it was a bit weird. [HI-2]

Using an electric toothbrush was typically discussed as more personal, intimate and private than the use of a manual toothbrush. At the very least, participants reported feeling less comfortable using the brush in front of friends or family members than they would have if using a manual brush. While the electric toothbrush is still so unstable as a legitimate ‘health’ artefact, given the threats of superficiality, there is perhaps less consensus around its ‘mouth rules’.

Across the data set, it was clear that objectification was often a contingent and uncertain process, with ongoing debate concerning how the aesthetics of social relations could be managed with the material possibilities and constraints of the artefact in the household micro-environment. Articulating the management of intimacy with such constraints as a lack of electric sockets in bathrooms entailed, for most households, ongoing negotiation. In one example, placing the toothbrush in the kitchen to allow easy access to an electrical outlet was a potential solution. However, this presented a new set of problems, as unlike the bathroom, where household members and guests are unlikely to be sharing the space at the same time, the kitchen is typically more public, with non-household members potentially present, and aesthetic concerns centred on misgivings around inappropriate ‘public’ use of the device:

Jenny: We put it in the kitchen because that’s the only place with a plug next to a sink ... and I can keep an eye on the baby in the kitchen while I clean my teeth and put my makeup on ... now I really associate putting makeup on with brushing my teeth.

Steve: I brush my teeth in the morning and evening down here then do everything else in the bathroom. It’s quite good because I can watch television down here while I do my teeth.

Jenny: Mind you if we had friends or anyone staying then I would feel too self-conscious. I would go upstairs and use the hand toothbrush – it’s too personal. [HI-1]

We can begin to see that Thorogood’s (2000) ‘mouth rules’ become further complicated when intimacy is mixed with a lack of available electrical sockets – to insert this gadget into ones mouth in private also required that one could insert a recharger into a ‘secluded’ electrical socket. Another solution to the problem of managing electric socket positioning without breaching the aesthetic rules of

maintaining appropriate privacy was to position the electric toothbrush in the bathroom with the recharging unit in another appropriate room (in this case the utility room off the kitchen). The electric toothbrush was then only periodically recharged when it was 'flat' and no longer operable. All the members of this household used the bathroom to brush their teeth. Again, however, keeping the recharge unit separate from the brush generated its own problems because the device's batteries tended to run flat thus rendering it inoperable for a period of time [HI-2]. Objectification was, therefore, an ongoing process in many households, with contingencies of material and social networks reconfigured with each new solution attempted.

Incorporation

The idea of incorporation into a domestic domain involves an artefact's everyday use becoming part of a regular temporal routine. A successful closure of this process would also imply that any problems associated with the artefact's use would have been overcome. It appeared that the process of incorporating the electric toothbrush into a domestic environment embodied a range of elements. These could be summarised as follows:

- Technique (how are the teeth brushed)
- Oral hygiene products used with an electric toothbrush (toothpaste, mouthwash, floss, etc.)
- Duration (e.g. use of a timer, length of time spent brushing)
- Time of day
- Sharing (heads, base, etc.)
- Location (bathroom, kitchen, moving around)

These elements were mediated in practice through three sets of concerns: meeting social and sensory needs; the incorporation of both routine and flexibility; and managing both the 'health' and the technological demands of the new device.

Preparing the social and sensory mouth

Patterns of use, and the routines that were established or not, reflected a distinction many respondents made between the social and the sensory body. Preparing the social body entailed practices associated with grooming the self for social interaction, such as cleaning teeth before going out. The more sensory routines related to the 'body work' entailed in keeping the mouth comfortable (caring for gums, removing food from teeth) and 'feeling' clean. Where electric toothbrushes had been successfully incorporated, participants typically described an overlap between

health, sensory perceptions, social preparation and morality, such that the mouth was comfortable, 'good' and ready for interaction as a result of using the device:

Phil: I'm really pleased with it, apart from having broken two already! But it's really good, and I really found it was kind of ... yeah, makes your gums kind of tingle afterwards, so obviously it's doing some good. And also, it makes me brush my teeth for longer, because I've got a two-minute timer on it, and the toothbrush I had before had no off-switch, so I just had to keep going for two minutes! So I got into the habit of that, and so I reckon they're getting brushed more ... more easily. [II- 2]

Processes of 'social' brushing were often incorporated as taken-for-granted, barely considered, routines:

Ian: I brush my teeth during the day quite often.

I: Really? And why do you do that?

Ian: I don't know, I just do. When ... usually it's just before I go out of the house, actually ... just whatever reason. I often go out in the middle of the day, because I work here, I work at home. So take the children to school, and then often go out, just before lunchtime, to go shopping, go and buy a newspaper, go to the library. [HI-2]

However, this taken for grantedness could be disrupted by tensions between social and sensory needs. Parental delegation of brushing surveillance was one arena in which the negotiation of conflicting needs was evident. In this family, for instance, the domestication of the electric toothbrush caused conflicts over the differential potentialities of toothbrushes for meeting social and personal sensory needs. On the one hand, the electric toothbrush regulated the length of time spent brushing, which some children found to be excessive. On the other, the electric brush was seen as rougher and less comfortable:

Daisy (age 7): I use the electric in the morning and I do hand at night.

I: Is there any reason for that?

Susie: There is a bit of a reason

Ian: It [the electric toothbrush] causes quite a few arguments because I say that they always ought to use the electric toothbrush, there's no reason not to ... but the kids have decided they only want to use the electric once a day for reasons best known to themselves ... why is it?

Ben (aged 9): I used to just use hand but now I have got more into the electric now because the hand is easier on your teeth the electric is rougher

Susie: What about timing because with the electric you [directed to child] have always got the two-minute timer so it takes you longer with the electric than with the hand. [HI-2]

Whereas the electric toothbrush might, in this mother's account, successfully delegate the 'work' of sufficient time spent brushing (maximising the preparation of the 'social' mouth), it less successfully produces a pleasant sensation within the mouth (being harder than the manual brush).

Routine and flexibility

This negotiation over usage suggests that successful incorporation of the electric toothbrush into the domestic environment depended in part on the extent to which the device could be both routinised within a domestic timetable, but also the extent to which the device could cope with flexibility. For an electric toothbrush to be incorporated into a domestic environment, unlike a manual toothbrush, a variety of additional and specific 'technology needs' have to be considered and balanced against any perceived health or other benefits. These include the need to plug devices in, recharge batteries, possibly resite electric sockets, manage new 'dirt' (such as dripping heads) and reposition existing appliances. The successful management of these issues is not a foregone conclusion, and interviewees recounted certain problems in successfully incorporating the electric toothbrush into the domestic home. For instance, a shared base unit, with each person having a separate head, caused conflict for one family over the teenage son's messy dental habits. The following exchange also further demonstrates the sensibilities surrounding the intimate detritus (Thorogood, 2000) from oral health cleansing:

Ian: When we first got it Ben [son, aged 9] like me read the instructions on the packet and it says when you have finished using it you take your head off and you run it and the unit under the tap ... Ben and Daisy [daughter, aged 7] often get angry with Jack [son, aged 14] because he doesn't do it and they come in to use the brush and his head is still sitting on the unit and it's all grubby and dripping bits of toothpaste ... it's annoying to them and it's annoying to me as well

Susie: Yeah it is annoying [HI-2]

Travelling away from home was one typical breach in routine that could test the flexibility of new devices in the home. Here, the electric toothbrush might fail to stabilise as a portable technology:

I: So you would never take the electric toothbrush anywhere?

Neil: I don't think so. It's just too much hassle ... but it's just ... too big ... I think probably the weight of the electric toothbrush would probably ... prevent taking

Lisa: Any way you can cut it down, really, like you don't buy a whole bottle ... you don't bring a whole bottle of, say, shampoo or something, you bring a small [bottle]

Neil: A small toothpaste, and

Lisa: Yeah, a smaller version of everything, so you just try and reduce the weight, don't you.

Neil: Yeah. I think so, so I think the electric one would be too heavy really. [HI-3]

Thus, we can see that attempts at incorporating the electric toothbrush into everyday domestic life met with a number of problems. These included: resistance from children over regular use (particularly in relation to the timer and the perceived roughness of the brushing); disputes over cleaning shared units; and problems with messiness.

Conversion

The partial processes associated with the conversion aspect of domestication reflect the role the technical artefact may have in household members' relationships with the wider social world. This could include the more symbolic aspects of objectification such as the artefact's place within the social network of the household, but also would take note of material work that users may have to do in order to maintain the technical artefact in working order (for example, purchase of batteries and replacement heads). It was not inevitable that such work became routinised: indeed, the failure to convert the electric toothbrush into sub-routines of shopping was frequently a factor in incomplete domestication:

I: Why did you stop using it?

Jim: Mainly because the batteries kept running out, and, of course, when they ran out, I never had any around ... I found out, after a while, I was turning it off and just using it as an ordinary toothbrush. [II-5]

In terms of symbolic aspects, we have seen how users felt that the device needed to be hidden because of its aesthetics (for example, Pat). Other users (Jenny, Ian) reported that they would be unhappy openly using an electric toothbrush, even in

the confines of their own homes (because it was too personal or because they would 'feel like a bit of a prat'). For these users, the electric toothbrush's symbolic relation to the external world was problematic. However, as more households convert – and the electric toothbrush becomes a taken-for-granted part of health equipment – they become visible as part of the network of other households' interactions with the wider world. Thus, one parent suggested that although he did not use one, electric toothbrushes were normalised for his children to the extent that 'when their friends come to stay, they often bring an electric toothbrush with them ... it's not so much a gadget' [HI-5]. Indeed, the device could become a prized indicator of the household's values for external visitors. One woman, Jenny, from the household who kept their electric toothbrush in the kitchen, reported that she 'liked having it there because people can see it' (HI-1). The artefact can thus act as an explicit display of a valued identity symbolising good dental hygiene as part of her active moral agency.

Discussion

This case study has provided a useful route for exploring an object that crosses the traditional boundaries of health, aesthetics and leisure consumption. Using a framework from STS, we have focused on electric toothbrushes to explore the processes by which they do, or do not, become domesticated or stabilised. Household interviews proved particularly useful as a method for generating health data on these processes for two reasons. First, the domestic location provided material cues to elicit household members' views and everyday routines. Being in the bathroom, looking at a dripping toothbrush, or an inconveniently placed socket, was a reminder of the mundane materiality of domestic life that might otherwise be difficult to recollect in an interview. Second, discussing household routines and decisions with all those who lived in a house allowed members to be explicit about negotiations that might otherwise be implicit, and thus more difficult to detect, in individual interview data.

To study electric toothbrushes seems, at first, inherently trivial. Indeed, as Michael (1997) has pointed out, many mundane technologies can fall prey to ridicule and humour, and diverse ways of 'inoculating' these technologies against ridicule may be needed. For example, many 'gadgets' attempt to anticipate derision in their advertising and packaging by stressing the seriousness of the artefact (for example, by citing 'important' but often industry funded research) or performing 'ridicule' as a positive 'geek' quality. As our data suggest, the electric toothbrush is perhaps typical of such everyday technologies, in that respondents who were not users regarded it as a humorous artefact, as an unnecessary or extreme use of technology. The electric toothbrush was liable to

be seen as a trivialisation of health that creates an ‘unhealthy’ desire for perfection, with the non-users’ accounts of representing a resistance to a fetishisation of the consumer body. The normative force of biomedical legitimisation was an important element in defending against this threat. This is of course used overtly by product manufacturers, who fund a large amount of the research that identifies the ‘benefits’ of electric toothbrushes (see, for example, Mielczarek *et al*, 2012). It is also a resource available to users, where a successful claim to the necessity of the toothbrush for health can offset potential ridicule or moral threats to an overly consumerist identity or can bolster parental governance strategies. The electric toothbrush, then, illustrates nicely how consumers reflexively manipulate goods in order to construct an idea of the self and of its relations with others. While not as prominent a display as other consumer goods (for example, clothes, car, holidays and so on), the electric toothbrush, as many of the participants in this study suggest, plays a role in the maintenance of self. This idea of self contributes to decisions about both the purchase of an electric toothbrush (including the decision not to purchase) and its post-purchase use. In terms of Fox and Ward’s (2006) characterisation of potential health identities in a period of reflexive modernity, the electric toothbrush user is neither an ‘expert patient’ nor quite an ‘independent consumer’. Rather, they are embedded in a network of ‘things’ and social relations, including those of (dental) biomedicine. We have shown how the very materiality of a device and the contingencies that are invoked by its adoption co-create social relations, networks and health identities. Fox and Ward (2006) have mapped out the territory of how cyberspace is used to extend the possibilities of health identities in late modernity. We suggest that there is nothing inevitable about how particular technologies (whether pharmaceuticals or toothbrushes) inscribe particular identities, or relationships to biomedical expertise. Instead, our interviewees drew on a range of discourses, including those of dental biomedicine, health, aesthetics and consumerism to account for the domestication (or not) of electric toothbrushes. Material objects (the toothbrushes, electric sockets, house layouts) in turn shaped the ways in which the device was (or was not) incorporated into those discursive networks.

By highlighting the idea of the ‘domestication’, we found the partial processes of appropriation, objectification, incorporation and conversion to be a useful conceptual frame for understanding the uptake and continued use of a domestic health technology. However, in practical terms, there was a considerable overlap between these conceptual stages. The respondents, in talking about their electric toothbrushes, were engaged in a constant balancing act between the basic needs that their electric toothbrush might fulfil (such as practical, social or health needs) and the aesthetic, moral, consumer and identity-based associations of the technology. The hybrid formed by the co-production of the electric toothbrush and the domestic environment was, in practice, an ‘unruly’ sociotechnical system. As Shove and

Southerton (2000) point out, it is wrong to read accounts of domestic technologies as ‘an unfolding narrative of a stable object’ (p. 314). For example, the technology analysed here mediated respondents’ health behaviours but, at the same time, their behaviours mediate the perception and use of the technology. Thus, issues such as travel needs, electrical outlets, time constraints and dripping toothpaste all played an important role in forming respondent’s opinions about incorporating a new technology into their oral health routines. We have shown how decisions about oral health consumption were confusing, even for technically literate users, because knowledge to make such choices could only be acquired through use. Artefacts required an enculturation process before a user could understand and comprehend their needs in relation to this domestic technology. The processes of objectification were rarely complete, as each household’s solution to the material, aesthetic and social challenges of the network generated its own new problems.

While these points about the contingencies of domestication may well be generalisable to other mundane domestic technologies, the electric toothbrush contains within it not just the ‘novelty’ of a technological solution but also the echoes of those technologies which it replaces: here manual toothbrushes and the cultural associations that they contain. We have shown how what Thorogood (2000) described as ‘mouth rules’ are both obeyed by the new technology (not sharing heads, not brushing in front of strangers) but that the scripts enacted by the ‘new’ technology are also rewritten, or at least up for negotiation, as household members debate the proper positioning, sharing, privacy and routine use of the new device. This was particularly evident in discussions with children within households, in which parents were intermediaries, along with toothbrushes, toothpastes and mouthwashes, in a chain stretching from the discourse of dentistry and ending up in the mouths of children.

However, according to accounts given here, many of these intermediaries, such as parents and manual toothbrushes, are not faithful to the discourse of dentistry. This would appear to be a classic case of the delegation of bodily movements to a device (Latour, 1992). Of course, this is not total delegation as considerable human activity is still needed, but the device can partially stand in for the moral discourse of oral hygiene. Yet even this limited deskilling of the human operator appears to be extraordinarily fragile and contingent – electric toothbrushes, as noted earlier, are ‘unstable’ objects. They required much else to be in place for them to work properly.

Conclusion

Electric toothbrushes are now widely used, and ‘normalised’ to a large extent in many households. An attempted legitimisation of their use by dental discourses

seeks to frame them as superior for oral health care. However, using a frame of domestication, we have shown how there is nothing inevitable about this process. It remains contingent, with the electric toothbrush still being 'resistable' and often becoming an unstable object within the domestic environment. Be this as it may, within our sample, the number of people who had never attempted to 'domesticate' the electric toothbrush was very small. Most had at some point bought an electric toothbrush and attempted to incorporate the device into their routines – indeed many had attempted this more than once. As a growing number domestic health technologies increasingly blur the traditional boundaries between health, aesthetics and consumption, perhaps the (in)stability of artefacts becomes less important than their abilities to perform across multiple arenas.

About the Authors

Simon Carter teaches and carries out research on science and technology studies as applied to issues of health and medicine at the Open University.

Judith Green is Professor of Sociology of Health at the London School of Hygiene and Tropical Medicine. She has researched and published on methodology, risk and the sociology of health.

Nicki Thorogood lectures and teaches on medical sociology at the London School of Hygiene and Tropical Medicine.

Note

- 1 This study received ethical approval from the London School of Hygiene and Tropical Medicine's ethics committee before the fieldwork commenced.

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