ESRC Research Brief

Antimicrobial Resistance

&

Psychology

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Introduction

Antimicrobial resistance (AMR) can be considered to be one of the greatest global health risks of modern times. Currently more than 700,000 deaths a year can be attributed to AMR. If the challenge of tackling AMR is not met, it is estimated that by 2050 at least 10 million deaths globally will be attributable to AMR per annum. Moreover, by the same year the financial cost of AMR will have reached $100 trillion USD, with a reduction in global GDP of between 2 and 2.5% (Review on Antimicrobial Resistance 2016).

Psychology is both a theoretical and an applied discipline. One of the characteristics of psychology is that it has always risen to the major challenges of the day. In recent years there has been significant input from psychology into developing solutions to the growing epidemic of obesity, including, for example, studies of the impact of the media and advertising (Boyland, Harrold, Kirkham, & Halford, 2012), and the impact of social norms on food consumption (Higgs, 2015). Psychology has also been making a significant contribution to tackling sustainability issues, climate change and global warming through behaviour change and the promotion of pro-environmental behaviour (Stern, 2011). Psychology as a discipline, is capable, well placed and structured to make a major contribution to tackling AMR.

Psychology is a broad-based discipline ranging from neuroscience to social psychology; from the study of synapses to social groups. Despite this broad range, psychologists have has yet to make its mark on AMR research, and its journals are still to publish a body of AMR research. The direct contribution of psychology as a professional and academic discipline to understanding AMR has therefore, thus far, been very small. Despite this, there are two factors that make a review of psychology and AMR worthwhile.

First, although psychologists have written few papers on AMR, many authors have raised issues that clearly concern psychology, and have made an important contribution to talking about AMR. The second factor is that there is significant potential for psychologists to address relevant AMR issues, and so the current review aims to set out some of the areas that would benefit from greater input from psychology, and the questions central to such endeavours. The review will therefore examine what is currently known about psychological phenomena relevant to AMR, highlight areas in which psychology and psychological theories could be making stronger contributions, and identify some of the larger gaps that psychologists should be involved in filling.

The Call for Social Science and Psychological Research

The opportunity is available for psychology to make a significant contribution to mitigating the threat of AMR. This was made clear by the introductory comments to the ESRC working group report on AMR. The chair, Professor Dame Sally Macintyre, made that observation that:

> "The mechanisms which lead to antimicrobial resistance are biological. However the conditions promoting, or militating against, these biological mechanisms are profoundly social. How our farmers, vets, and regulatory systems manage livestock production for human consumption; how regulatory and fiscal frameworks incentivise or deter antimicrobial development, production and use; how the public and healthcare professionals understand, value and use antimicrobials; the context in which animals and humans interact; the ways in which particular groups of humans are exposed to particular microbial infections; all these are shaped by social, cultural, political and economic forces. Social science therefore has a key role to play in measuring, modelling, understanding, and where appropriate changing the social environment in relation to antimicrobial resistance." Professor Dame Sally Macintyre (ESRC Working Group Chair) (ESRC, 2014)

Of course, the comments are directed towards the whole range of social sciences, but in placing behaviour at the centre of the fight against AMR it also puts psychology at its heart. Similarly, the ESRC call for research on *Antimicrobial Resistance: Behaviour within and beyond the health care setting* (ESRC, 2015), also opens a significant space for psychology.

The other point to note in the Macintyre's comments is the reference to livestock. With the use of antibiotics in animals outstripping its use in humans, in terms of its volume, it is clearly an issue that is of importance. The behaviour surrounding the use of antibiotics in animals has received attention, though less than that for human health. Again, the work tends not to have been driven by psychologists, nor has it been published in psychology journals.

Psychologists have shown some awareness of AMR and the challenge (e.g. Tonkin-Crine, Yardly & Little, 2011). This is likely to increase as general awareness grows and funding bodies develop research initiatives. In the same way that approaches have emerged to address other modern-day challenges, they will surely emerge in relation to AMR. But as with other areas, there will need to be a shift change in creativity and imagination. *The Psychologist* recently published a short report on the "role of psychology and psychologists in tackling a major societal issue" – one of which was responsible antibiotic use.

> "Professor Karen Rodham…Chair of the British Psychological Society's Division of Health Psychology, pointed out why AMR poses such a problem and how health psychologists in particular could be part of the solution. . . First, by providing communication skills training to increase health professionals' confidence in their ability to have the challenging conversation with patients to explain why the prescription of antibiotics is not appropriate; second to train health professionals to engage in shared decision-making with their patients; and third, by designing theory-informed awareness-raising materials to address misconceptions about the efficacy

of antibiotics. She concluded: 'In short, health psychologists are very well placed to contribute to solving this thorny issue' "
https://thepsychologist.bps.org.uk/championing-responsible-antibiotic-use 2 July 2016

While psychology clearly has a role to play in communication, and in training groups in various skills, the potential of psychology goes a long way beyond that. There are many different areas of research and application that psychology can contribute to and lead on.

The ESRC have set out the primary areas of social science research focus for tackling AMR. These include: awareness and engagement; public health as an alternative to AMs; informal markets; stewardship and appropriate use; reducing barriers to developing new AMs. Each of these opens opportunities for psychological research. For instance, awareness and engagement would benefit from examining the best strategies for increasing public awareness, how AMR fits into people's system of conceptualizations of different health or global threats. Equally, psychology has for some time been seen as significant in improving public health (e.g. Ewart, 1991). Of these five areas of strategic importance, psychology's role is likely to be most prominent in stewardship.

At the heart of much thinking about AMR and behaviour is the notion of the stewardship of the use of antimicrobials (AMs) and in particular antibiotics. Antibiotic stewardship is essentially looking after the use of antibiotics in such a way as to preserve their efficacy in all contexts. That includes human health, and so relates to GPs and primary care, hospitals, prisons, nursing homes, dentists and anywhere that antibiotics are administered. It also includes the use of antibiotics in animals. That use encompasses a wide variety of contexts, though mainly the livestock industry, and domestic, companion animals. Other groups are also relevant, such as racehorses and fish farming. It is not only the prescribers that are of significance to AMR research. In relation to animals, vets will prescribe and supply AMs and quite often farmers and producers will administer them. In the context of human health patients also have a role to play, for example in reducing their expectation of receiving antibiotics. It is therefore necessary to include the users as well as the prescribers to understand the social and psychological mechanisms underlying of stewardship.

Behaviours and Areas of Research

A number of important areas of behaviour that are relevant to the development of AMR have been examined. In the following sections some of those with significant potential for research will be considered.

Influences on Prescribing

As with other areas of AMR research, psychologists have not been prominent in researching factors affecting stewardship and prescribing. A large number of studies have, however, been conducted by researchers from other disciplines. These studies often draw on concepts from psychology as well as point to areas where psychology has a further role.

A systematic review and meta-ethnography of antibiotic prescribing by GPs for acute respiratory tract infections (ARTI) (Tonkin-Crine, Yardly & Little, 2011), led by psychologists, provides some light on the underlying factors that influence GP decisions. One of the clear messages from the review is that prescribing decisions represent complex behaviour that is unlikely to be susceptible to simple, universal interventions. Whilst that may not seem surprising, it seems often to be the case that simple, generalizable solutions are sought. Psychology could rise to the challenge of helping unravel that complexity.

The meta-ethnography conducted by Tonkin-Crine et al. (2011) identified seven themes on perceptions of antibiotic prescribing decisions and five GP's perceptions of interventions aimed at reducing inappropriate antibiotic prescribing. The seven factors that influenced the GP's decision-making were uncertainty, previous experience, perceptions of acute respiratory tract infections, external pressure to reduce prescribing, potential conflict with patients, provision of patient-cantered care, and occupational pressure. Each of these factors requires research in their own right and an understanding of how they interact and work as a system in different contexts. There are also questions as to whether these findings are limited to ARTI, GPs and human health. The factors affecting vets' decisions will be discussed later, but they too are complex.

A particularly interesting feature of this meta-ethnography is the perceptions of GPs of what sort of interventions helped the GP to prescribe more appropriately. These included interventions that lead GPs to reflect on their own prescribing, help decrease uncertainty, educate about appropriate prescribing, facilitate more patient-centred care, and that can be beneficial to implement in practice. In another study, it was found that providing GPs with support tools and improving their communications skills could improve their prescribing (Anthierens, et al., 2015).

Stewardship is, of course, multi-faceted. As well as prescribers, the potential recipients of antibiotics are also of importance in ensuring appropriate prescribing and use. It has been suggested that GPs are under pressure from their patients who expect to be prescribed antibiotics, even when they are inappropriate and unlikely to be effective. As Tonkin-Crine et al.'s (2011) study, as well as others (e.g. Barden, Dowel, Schwartz & Lackey, 1998; Palmer & Bauchner, 1997) show, there has been some support for this view. However, other research has been less clear, suggesting the processes may be subtle (Stivers, Smith & Elliot, 2003). For instance, Stivers et al. failed to find any patient directly requesting antibiotics. Interestingly there is also indication that the social class of a patient can influence intention to prescribe, with GPs being more likely to prescribe to patients from a lower social group (Walker et al., 2001). This opens a lot of questions worth exploring, for instance, more needs to be done to understand the impact of cultural and demographic factors. It also points to the dangers of over generalization.

Studies have looked at factors influencing prescribing in animal health and food production. Gibbons et al. (2013) examined non-clinical influences on veterinary practitioners working in the bovine industry in Ireland. Client demand was a strong pressure to prescribe, as was fear of being blamed if the antibiotic was later shown to be necessary. This can be compared to human health where similar pressures have been found to impact some practitioner decisions. Vets gain income from prescribing antibiotics and for visits, however these did

not seem to be factors that influenced prescribing amongst the respondents in this study. There also seemed to be more of a propensity to prescribe rather than offer a return visit should the animal not improve. The authors suggest that this is perhaps a means of cutting down on workload. Again there are parallels in human medicine. As these are not pharmacological or clinical decisions, it is clear that psychology has a lot to offer in understanding these decisions and in suggesting interventions to improve the decision-making.

Coyne et al. (2014) looked at prescribing behaviour in the UK pig industry. They examined both the views of farmers and vets in a qualitative study. Their results showed that the two groups were influenced by different factors. Veterinary respondents felt subject to external pressures, clients, legislation and public perception, all of which influenced prescribing behaviour. Farmers were more production orientated and took into account farming systems and management in decisions about antibiotic use. Examining the culture of prescribing in the pig industry, Coyne et al. (in press) revealed that vets had a strong sense of social responsibility for the appropriate use of antibiotics. They also identified management practices that increase the need for antibiotics, but that they felt changes to them were not viable because of cost implications. As with other studies, vets felt under pressure to prescribe antibiotics.

Normative influences

Some of the research described hints at the potential importance of 'norms'. Within psychology the term norm has a number of meanings. The particular type of norm will be likely to influence behaviour in different ways. One of the clearest distinctions is between descriptive norms and injunctive norms. Descriptive norms are the behaviours that people *normall*y engage in. Injunctive norms refer to what is considered to be morally right to do and what will be approved of or disapproved of. In relation to, for instance, prescribing antibiotics, there may be a descriptive norm in the sense that "everyone prescribes antibiotics for sore throats" as well as an injunctive norm that "it's morally wrong to use antibiotics for ARTIs and that the Chief Medical Officer (among others) disapproves of it". Clearly, different norms tap into different behavioural drivers or motivations. Consequently, in attempting to bring about behaviour change, it is important to identify which normative influences are most salient.

A small number of studies have shown how norms can influence prescribing behaviours. Hallsworth et al. (2016) examined the impact of social norm feedback on GP prescribing in practices whose prescribing rate was in the highest 20% of their local NHS practices. The experimental group was sent a leaflet about antibiotics and a letter from the Chief Medical Officer. The details of the letter show that it evoked both descriptive and injunctive (moral) norms. The letter, for instance, pointed out that the "majority (80%) of practices… prescribe fewer antibiotics per head than yours." It also makes the point that "Reducing unnecessary prescriptions in primary care may help prevent a public health catastrophe." Other conditions were introduced later, but the important finding here is that those who received the letter reduced their use of antibiotics by a statistically significant degree and significantly greater than those who were not sent the letter.

It would be predicted from psychological theory that providing normative feedback would be likely to have an effect on behaviour. Normative feedback can take many forms and vary according to the normative group referred to in the feedback. There are many examples in the psychology literature of normative influence. A simple and effective illustration is provided by Goldstein, Caldini and Griskevicius (2008). In this study the researchers left messages to encourage towel reuse in hotels. In one condition, guests were asked simply to help save the environment. In the normative condition they asked people to join *their fellow guests* in helping save the environment. There was a statistically significant difference in the behaviour of the two groups with the normative group showing more reuse. The authors extended the study by including a range of normative groups relating to different social identities, with interesting results. The researchers first established the various identities that the individuals associated with. Normative appeals where then given to different participants. The results demonstrated that the most effective normative appeals do not coincide with the most important identities of the participants.

Goldstein et al.'s research is of significant importance for the design of normative interventions. Primary care medics, vets and others all have multiple identities, including their professional identity, but also identities such as parent, spouse, and citizen. To date studies appear to only appeal to professional identities, with varying success. It is possible that targeting other identities, such as parent, would have a greater effect on prescribing behaviour than, for instance, appealing to the prescribers professional identity of GP or vet.

Norms do not exist within a vacuum nor are they independent of other traits or beliefs of the individuals behaving within a normative framework. For instance, the degree to which someone trusts others can mediate the impact of normative appeals on behaviour. Rönnerstrand and Sundell (2015) used a social capital framework to examine the impact of trust and reciprocity on people's preparedness to delay using antibiotics. Social capital is essentially concerned with cooperation stemming from norms, trust, and structures that facilitate cooperative behaviour (Putmam, Leonardi & Nanetti, 1992). Evidence supports the view that norms are important in shaping people's behaviour when there are choices between self-interest and cooperation for the common good (Putman, et al., 1992). Norms of cooperation are related to norms of reciprocity and trust (Putnam, 2000; Rönnerstrand & Sundel, 2015). If people trust others and believe that others will reciprocate behaviour that is for the collective good, they themselves will sacrifice immediate self-interest for the collective (Rönnerstrand & Sundel, 2015). The researchers conducted two experiments, the results of which showed that there was a positive relationship between the numbers of days participants said that they would be willing to postpone taking an antibiotic and their level of generalized trust. There was a similar finding for generalized reciprocity, with a positive and statistically significant relationship between the number of days participants said they would be willing to delay taking antibiotics and the number of days they were told *other people* would delay.

The findings of Rönnerstrand and Sundell's experiment are again in accord with Goldstein, et al.'s (2008) research on pro-environmental behaviour. The latter study, however, suggests some important directions that research on social capital and behaviour in relation to antibiotics could take. The clearest is the need to examine the normative group that the target group is compared with.

The impact of education and training

One key area of importance for achieving appropriate use of AMs is the education and training of prescribers. As long ago as 1993, the British Society of Antimicrobial Chemotherapy (BSAC) Working Party on the use of AMs concluded that knowledge of prescribing amongst clinicians was inadequate and was a factor in the inappropriate use of antimicrobials (Davey, Hudson, Ridgway, & Reeves, 1993). Despite its importance, relatively little is known about the medical and veterinary teaching of stewardship and the knowledge, attitudes and behaviour of students (Davey, et al., 1993; Pulcini & Gyssens, 2013). From those studies that do exist, evidence suggests that even when students have knowledge of AMR, their level of understanding is sometimes shallow.

Castro-Sánchez et al. (2016) have reviewed the provision of teaching of antibiotic stewardship in UK medical, veterinary, nursing, dental and pharmacy education. They conclude that it is covered in most undergraduate healthcare and veterinary degrees, but that in other areas it is disparate. In a US study, Abbo et al. (2013) demonstrated differences between leading medical schools in knowledge about antimicrobial use, the preparedness of the students and the resources given to teaching the subject. This suggests a need for a wider audit of education and some standards within training.

In a relatively early study in the USA, Ibia, Sheridan and Schwartz (2005) found that there were significant gaps in medical students' knowledge about appropriate prescribing of antibiotics for upper respiratory tract infections. This was despite students all (99%) having been informed during their education of problems with AMR. A study of medical students in Thailand (Chuenchom, Thamlikitkul, Chaiwarith, Deoisares, & Rattanaumpawan, 2016) found that only half of the students in their final year, spent in practice, were aware of the existence of Antibiotic Stewardship Programmes in their hospitals. Further Chuenchom at al. (2016) found that the students' knowledge in relation to various aspects of AMR was limited, as was their knowledge of antimicrobial use.

A study that included participants from seven medical schools in Europe demonstrated that students had a good degree of awareness of some aspects of AMR, but not others. For instance, they were aware that it is a significant problem and that prescribing would contribute to resistance (though only 66% held that view) and that it would be a problem in the future. However, on less well-publicised issues they had little knowledge. For instance, students believing that incidence of MRSA were increasing, when the number of cases is falling, and significantly overestimating AMR related mortality compared to other causes of death including lung cancer (Dyar, et al., 2013).

Research on education in AMR and the use of AMs highlights that while training exists, it is varied between disciplines, institutions and countries. Further, its impact on students' and, later, junior practitioners' knowledge may be inadequate. Students have been found to want more instruction on AMR and prescribing in Europe (Dyar et al. 2014) and the U.S. (Abbo, et al., 2013; Minen, Duquaine, Marx, & Weiss 2010). There are numerous challenges that psychology can meet in identifying ways to improve on education and learning, highlighting the most effective methods of delivery and improving curriculum design.

Guidelines and Decision Support

Related to the impact of education and training on prescribing is the provision of decision support tools. As part of stewardship and in an attempt to improve prescribing practice, increasingly there are guidelines and protocols for health practitioners to follow. Some of these are supported by decision making aids including computerized systems and smart phone apps. As psychologists working in other areas such as sustainability have shown, introducing technological fixes and aids does not guarantee that people will use them (Stern, 2011). It is therefore important to understand how guides and decision supports are experienced and perceived and that those experiences and perceptions are taken into account during implementation.

An interesting study in Singapore examined the introduction, over two years, of a computerised system; the Antibiotic Resistance Utilisation and Surveillance-Control (ARUSC) (Chow et al., 2016). The hospital based system is triggered automatically when a restricted antibiotic is prescribed. Additionally, it can be used to support a doctor's decision making by providing guidance as to the appropriate antibiotic. The examination of its use found that there was a much greater likelihood that advice and guidance was followed (89%) when it had been requested, compared to when the system was automatically triggered (40%). Chow et al. also identified differences between junior and senior staff in their perceptions of the system. Junior staff found the system useful, compared to senior staff that considered it reliable, but often in conflict with their prescribing preferences. The difference between junior and senior staff and prescribing behaviour is something that is evident in other studies, including in relation to vets.

Venugopalan et al. (2016) examined reactions to an Antimicrobial Stewardship Programme in a US hospital. While most of the participants, physicians, thought it led to improved patient care, similar to the computerised system in Singapore, a significant number (45%) felt that their autonomy was limited by the programme. A third of medical residents (House Officers) felt the programme forced them to prescribe antibiotics that they thought were inappropriate. As with Chow et al.'s study, there is a need to understand perceptions of the programme in order to optimize it.

There is a very small amount of work on the use of guidelines in veterinary practices. In a study carried out with small animal veterinary practices in the UK, Hughes et al. (2012) found only 3.5% of their sample has an antimicrobial use policy.

It is clear from this that a system's acceptance is not automatic even if considered reliable and that there may be age, experience and status factors to take into account. Studies are needed that consider the acceptability of different systems. However, it is important that studies also examine the introduction of systems within context and in relation to the experience and demographics of those who will be using them. While the work of Venugoplan et al. and Chow et al. has provided a useful starting point, more sophisticated data collection and analysis using psychological models would be likely to yield greater insights.

Approaches to Understanding Behaviour and AMR

There are a number of theoretical and conceptual approaches that are useful in researching phenomena that have decision making at their centre. Two of those with significant potential are social dilemmas and the Theory of Planned Behaviour. Both of these have been used to good theoretical and practical effect in challenging areas to which psychology has been applied.

Social Dilemmas and the Tragedy of the Commons

Although not made explicit by the authors, Rönnerstrand and Sundell's (2015) study, cited earlier, points directly in the direction of social dilemma. Social dilemma as an area of thought and study gained particular interest after publication of Hardin's *The tragedy of the commons* (Hardin, 1968). What characterizes the commons dilemma is the presence of limited resources that will be depleted through over use and lack of cooperation.

The notion of the dilemma of the commons is well established in the social sciences including economics, human ecology and psychology. It is a concept or approach that has been particularly useful in areas that deal with major societal and global problems. This way of thinking about problems has been applied to, for instance issues of sustainability, climate change, and a variety of specific pro-environmental behaviours. The use of AMs, especially antibiotics, and AMR is a prime example of the type of dilemma that could benefit from study.

Baquero and Campos (2002) were the first to identify antimicrobial chemotherapy as a tragedy of the commons. Metlay, Shea, Crossette and Asch (2002) in the same year pointed out "optimal use [of antibiotics] from the perspective of the community (reserving newer agents for future use) is not always consistent with optimal use from the perspective of the individual patient (prescribing newer, broader agents)" though they didn't frame this as a social dilemma or a tragedy of the commons.

Social dilemmas have three characteristics. First, if an individual is selfish, or does not cooperate they will profit more than if they do cooperate. Second, when individuals fail to cooperate, the outcome for others is always harmful compared to the outcome of cooperating. Finally, the total amount of harm done to others is greater than the benefit to the individual (Kopelman, Weber & Messick, 2002). It is clear that the profligate use of antibiotics will lead to the depletion of a resource, which will have significant consequences for the world population. The lack of new AMs further emphasises the limits to this important resource.

O'Brien et al. (2014) conducted an interesting study in which they looked at the beliefs of infectious disease experts on the individual and societal consequences of antibiotic use. There results showed that 96% believed that the overuse of antibiotics could result in a "tragedy of the commons". From the perspective of reducing antibiotic use this can be seen as positive. However, trade-offs and decisions can be more complex. The authors demonstrated this by also asking participants' views of mass treatment programmes and whether they could be beneficial at a societal level. Mass treatment programmes involve

treatment, often with antibiotics, of large populations for a particular disease. The aim is to reduce the morbidly and mortality associated with the disease. The study found that over 90% of the infectious disease experts felt that they could not be effective. The evidence is that many of these programmes can in fact be beneficial in terms of the target disease, and reduce risks from other diseases almost as a side effect (Coles et al., 2012). This is important because it emphasises the complexity of social dilemmas and that a focus on reducing antibiotic use may not be universally the best practice. Studies need to take these instances of positive, high-level of use into account.

It is interesting that medical practitioners recognise the tension between the individual and the community. To a great extent this is at the heart of drives to improve stewardship of antibiotics in human and animal fields. Trying to understand how practitioners grapple with this dilemma is an important part of the research endeavour and is an area that psychology can contribute to in many ways. The important indication from O'Brien et al.'s (2014) study is that practitioners may be sacrificing other community benefits that come from the use of antibiotics. It is possibly as detrimental to the community if beliefs are held that mass treatment programmes should not be engaged in, as it is that antibiotics are used inappropriately. The other dimension to this is that mass treatment programmes are more likely in low and middle income countries than they are in the richer countries. In itself that poses a second social dilemma; should the benefit of treatment programmes in low-income countries be sacrificed for the benefit of antibiotic efficacy in richer countries.

There has been little AMR research in psychology conducted within the social dilemmas framework, but it would seem it has significant potential, because medics, and vets, on a daily basis, face dilemmas about antibiotic use. The mechanisms by which this might impact their decisions are not likely to be simple or obvious. How people make decisions will be in part determined by norms, and how they believe others will view their behaviour. When resolving a social dilemma, the decision maker will have to assess the view of more than one person or group. Milinski, Semmann and Krambeck (2002) have shown how people are engaged in many different relationships, that these relationships can require reciprocity, and that concerns over reputational risk can maintain behaviour positive to the common good. Therefore, while an individual may be able to benefit from a selfish act, the damage it might do to their reputation will prevent them engaging in the behaviour. Similarly, if a person requires a reciprocal supportive action from another, they may again resist engaging in purely self-serving activity. Milinski, et al. (2002) point to reputation and reciprocity that influence social dilemma decision-making, but there will be many others. This area therefore provides an interesting and potentially productive research avenue for psychology.

The fields of social or commons dilemma and social capital are likely to be fruitful in understanding behaviour and in tackling AMR. These areas of research are very large and beyond the remit of this review. However, there are a number of papers that give a more detailed overview. Van Lange, Joireman, Parks, and Van Dijk (2013) have reviewed the field of social dilemmas and highlighted some of the interesting psychological areas that could be investigated in relation to AMR in general and stewardship in particular. These include social value orientation, trust, decision framing, priming, heuristics and emotion. Kopelman et al.,

(2002) provide a review of some experimental approaches to and studies in the psychology of social dilemmas.

The Theory of Planned Behaviour: Attitudes, Norms and Behaviour

One of the more powerful models in social psychology that has considerable potential in understanding behaviour in relation to AMR is the theory of planned behaviour (TPB; Ajzen, 1988; 1991). The application of the TPB to AMR research could provide an empirically grounded model to help understand the behavioural drivers of AMR. The TPB views behavioural intention as the immediate determinant of the corresponding behaviour. Intentions capture the factors that influence behaviour, and are indicators of how hard people are willing to try, or of how much effort they are planning to exert, in order to perform the behaviour (Ajzen, 1991). Intention is strongly related to behaviour (Sheeran, 2002). Therefore, if intention can be predicted, actual behaviour can also be predicted.

Behavioural intention is predicted by measures of attitude, subjective norm, and perceived behavioural control (PBC). These refer to a person's evaluation of performing the behaviour, their perception of other people's normative views of the behaviour, and their perceived control over performing the behaviour. For example, in prescribing behaviour, a person will prescribe an antibiotic if they evaluate it positively, perceive social pressure to use it, and believe they have the necessary opportunities and skills to use it. Of course, the reverse of this applies also. A person may decide *not* to prescribe an antibiotic if they evaluate non-prescription positively, perceive social pressure not to use antibiotics, and believe they have the necessary opportunities and skills to treat the patient with an alternative method. The TPB traces the causes of behaviour through a number of intervening processes to the individual's beliefs. The central premise of the model is that the sequence leading from beliefs to behaviour is a rational process, one in which individuals systematically consider, process and utilize the information available to them to arrive at a behavioural decision. The utility of this approach lies in its potential for developing successful educational or behavioural interventions, targeted at whichever component is most important with a view to modifying behaviour.

The TPB has been successfully used in many areas of psychology. For instance, it has been successfully used in relation to significant societal issues such as climate change and sustainable behaviour (Donald, Cooper & Conchie, 2014). It has also been applied to health related behaviour in general (e.g. Godin, Bélanger-Gravel, Eccles, & Grimshaw, 2008). Some studies have touched on issues related to AMR, but have not had it as their central focus (e.g. Liabsuetrakul, Chongsuvivatwong, Lumbiganon & Lindmark, 2003; Limbert & Lamb, 2002). For instance, Limbert and Lamb, both psychologists, used the TPB to examine factors involved in hospital doctors following medical guidelines (Limbert & Lamb, 2002). They included guidelines for using antibiotic, but their focus was on following guidelines rather than the issue of antibiotic use. To date there have been a surprisingly small number of AMR studies using TPB. Of those that have been conducted, the results are not particularly consistent. This is probably because they address different populations of medical professionals in different areas of the health systems and in different countries. Awareness of AMR and the role of antibiotics are fast moving. Therefore, studies carried out twenty years ago were conducted in a very different landscape to that of today.

The earliest study using an previous version of the TPB (Theory of Reasoned Action, which excludes PBC) examined antibiotic prescribing in a managed care setting in the USA (Lambert et al., 1997). Looking at the prescribing behaviour of 25 physicians over a 3-month period in 1994, neither attitude, subjective norm nor intention were predictive of behaviour. The authors hypothesise that in managed care settings there are a set of non-psychological factors involved in prescribing which, essentially, override individual psychological factors such as attitudes. What this suggests is that the realities of a medical context and the many factors involved in decision-making take primacy over individual psychological factors. Whilst this might reduce the apparent importance of psychology, it raises questions about how circumstances can be created where psychological processes such as attitude will dominate or at least be a significant factor in decision-making. This is important because if psychological factors are overridden by other pressures it will not be possible to change behaviour by addressing such things as knowledge, attitudes, and norms.

It does seem to be the case however that in other instances psychological processes do play a part in behaviour. Walker, Grimshaw, and Armstrong (2001) carried out another early TPB study investigating GP intention to prescribe antibiotics for sore throats. The authors examined direct and indirect TPB measures. These predicted 48% of the variance in intention to prescribe. The additional variable of past behaviour accounted for a further 15% of the variance. The authors also examined the salient beliefs underlying the intention to prescribe. There are a number of interesting results, but in particular that those who intended not to prescribe any antibiotics held a stronger belief that AMR is a concern. This study, contrary to Lambert et al.'s, shows that psychological factors are important. But of course, Walker et al. did not measure actual prescribing behaviour, only intention, which, in the case of prescribing might not be an adequate predictor of behaviour. This is therefore an area that would benefit from clarification from further psychological research.

Cortoos, Schreurs, Peetermans, De Witte and Laekeman (2012) more recently conducted a TPB based study examining intention to follow antibiotic prescribing guidelines. They carried out their research in hospital settings in Belgium, investigating intention in relation to attitudes, subjective norm and PBC. They also included habit in addition to the TPB variables. This is useful and interesting as the previously reported studies show that past behaviour (which could imply habit) predict prescribing intention. Overall the results of hierarchical linear regression, with intention as the independent variable, showed that when all of the demographic and TPB variables and habit were entered into the regression, the only predictors of intention were PBC and habit, with 13.4% of the variance in intention being accounted for. Further analysis revealed a difference between residents (house officers) and staff (consultants). For residents, PBC was the only predictor, whilst for staff, habit was the only predictor of intention.

The results of Cortoos et al.'s research indicate that different psychological processes may underlie the behaviour of different groups, in this case early career and more established medics. The corollary of this is that interventions would need to be different for different groups. In the case of medical residents, it may, for example, be important to ensure they feel they have the knowledge and skills to diagnose and treat patients without using

antibiotics. In the case of more senior medical staff, an intervention might be more fruitfully directed towards breaking their habit of prescribing antibiotics.

However, the conceptualization of habit in the study is problematic. Intention is considered to be an outcome of attitude, subjective norm and PBC. These are conscious components of a decision-making process that lead to the forming of an intention, which then leads to behaviour. Habit is not a conscious process, but rather an automatic one, linking directly to behaviour. Intention cannot therefore be considered as a dependant variable in relation to habit (Donald, et al. 2014). Or to put it another way, the psychological processes that lead to behaviour as a result of habit are different from those that lead to intention; they are different pathways to behaviour. This distinction has been considered in other areas of psychology where TPB has been applied. It would be useful to conduct investigations into the role of habit in a more conceptually sound way.

TPB has also been applied to animal health in general (Christley, Robinson, Moore, Setzkorn, & Donald, 2011) and in veterinary use of antimicrobials in particular. Jones et al. (2015) conducted a study examining dairy farmers use of AMs and the attitudinal factors that drove their decisions. Interestingly, they only found a weak correlation between past behaviour and intention. The strongest predictor of intention to reduce the use of antibiotics was normative and included their "social and advisory networks". Again this points to the importance of social context and social norms, which have been identified in many of the studies described. An additional interesting finding by Jones et al. was that the more commercially aware dairy farmers were, the more likely they were to intend reducing the use of antibiotics. Overall the findings indicate the usefulness of communicating the normative views, for instance of vets, and the financial benefits of reduced antibiotic use.

McIntosh, Dean and colleagues have published a series of papers using the TPB to examine the use of antibiotics in feed-lot operators and vets in the U.S. (e.g. Dean & Scott, 2005; Dean, McIntosh, Scott, & Barling, 2011; McIntosh et al., 2009; Jan, McIntosh, Scott, Dean, 2010; Jan, McIntosh, Dean, & Scott, 2012). The results of these publications present a detailed account of their findings. They are also usefully brought together and summarized in a paper by McIntosh and Dean (2013). These papers demonstrate the complexity of the drivers of behaviour in relation to the use of antibiotics and highlight the need to be clear about the particular contexts in which they are being used and the particular actors involved. For instance, in looking at subjective norm they found that the circumstances in which antimicrobials would be used (e.g. acutely sick or chronically sick cattle) influenced who the vets or operators perceived as an important norm group.

The TPB is one of the most powerful psychological models within social psychology. There has been some use within the field of AMR, but there are significant problems with the studies to date. It is very difficult to compare the results in any meaningful way, and so the cumulative knowledge from the work is limited. Nonetheless the research using the TPB points to some clear areas that would be fruitful to examine or develop further.

Additional Reviews

Two areas that have been mentioned in previous sections and which are critical in AMR research are behaviour change and the use of AMs in animals. Here two reviews of these areas are described and recommended.

Behaviour Change

Throughout this review implicit and occasional explicit reference has been made to behaviour change. Areas have been discussed, such as stewardship, that require behaviour change, while other sections deal with factors that underlie behaviour, including norms and attitudes, that may be the targets of behaviour change interventions. There are few if any peer reviewed papers that tackle behaviour change in relation to AMR that use sound psychological theory. However, there has been a start to addressing this central issue. Public Health England have recently published an excellent review of behaviour change research and discussed its application to reducing the use of antibiotics (Pinder, Sallis, Berry, Chadborn,2015). There are a number of theories that can underpin behaviour change, and some have been discussed here. Consideration of other theories of behaviour change is beyond the scope of this review. However, a good place to start is Public Health England's Review.

Vets and Farmers

A number of research papers examining the use of antibiotics by vets and farmers have been referred to in this review. A recent rapid evidence assessment review of the literature on antimicrobials conducted on behalf of DEFRA provides a useful resource to further consider AMR related issues and antibiotic use in animals.

The review used a variety of search terms resulting in the identification of 31 papers, after various filters and criteria were applied. The authors of the report helpfully note the principal disciplines of the study researchers. None are psychologists. The majority of studies identified do not relate directly to psychological issues, but a small number do. Of the papers, one is published in a psychology journal, though the authors are from sociology and veterinary medicine. Four of the papers can be considered to have psychological issues reasonably central to their concerns. Another six papers could be considered to be borderline in terms of dealing with psychological issues. Whilst this is a personal assessment, with no reliability check, it does give an indication of the volume of psychologically relevant research available. The studies that clearly address psychological issues are Coyne et al (2014); Gibbons et al (2013); Dean et al (2011); Jan et al (2010); and McIntosh et al (2009). All of these have been mentioned here previously.

Those that do address psychological issues but perhaps slightly less so are included in the reference section of this report, though not in the review. These are Busani et al (2004); Friedman et al (2007); Green et al (2010); Higgins, Dryden, and Green, (2012); Pinchbeck et al. (2012); and Swinkels et al (2015).

Conclusions

Psychology's contribution to the fight against AMR has not, to date, been particularly significant. That is in the sense of psychologists conducting significant bodies of research, or psychology journals publishing a corpus of research. Yet, there is a growing collection of research outside of the discipline that draws on psychological concepts and theories; some, and by no means all, of which have been identified here. Psychological concepts and theories have already borne fruit in terms of forming the basis for interventions. The growing call for behavioural and social science research is inevitably going to bring more psychologists into the field of AMR research. This should not only be health psychologists, but should include economic psychologists, in modelling decision making, for instance; organizational psychologists in examining how practices in organizations such as hospitals and management styles, among other things, can influence AMR related behaviour. Social psychologists have long pioneered research on behaviour, attitudes and behaviour change. Environmental psychologists will have a role to play examining how the use of spaces and buildings can be used to tackle issues related to AMR. Given the substantial resources being invested in AMR research by the research councils, governments and others, along with psychology's potential, it is inevitable that the future contribution of the discipline will far exceed that which it has made to date.

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