Risk Preferences in Surrogate Decision Making

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Abstract

Decision research has long focused on how we make decisions for ourselves, yet a considerable proportion of the personal and professional decisions we make are on behalf of others, which we term surrogate decisions. This thesis investigates the psychological processes involved in surrogate decision making. It features a first set of studies which compare financial and medical surrogate decisions and a second which address the complex process of making difficult medical decisions for our loved ones. This thesis makes valuable contributions to the field by providing empirical, theoretical, methodological and practical insights into making decisions on behalf of other people.

Executive Summary

The decisions we make for ourselves have been extensively studied, yet a significant proportion of our daily decisions are made on behalf of others – surrogate decisions. This thesis furthers our understanding of the psychological processes involved in making surrogate decisions involving risk. Previous research has largely compared our own decisions to those we make for others. A coherent account of self-other differences is lacking in the financial domain, which this thesis aims to construct. On the other hand, findings in the medical domain have been consistent and now require an in-depth exploration of the decision process.

Paper 1 involved a meta-analysis of 49 studies on self-other differences in risk preferences across domains. There was no overall self-other difference, but there were moderating effects of domain and frame. Medical decisions were more risk-seeking for self than for other. There were no overall self-other differences in the financial domain, although there was a moderating effect of *frame*. Studies in both domains varied in significance, making it worth assessing whether outcome magnitude could account for these domain differences.

Paper 2 investigated how the frame and significance of a decision affect self-other differences in the financial and medical domains across three experiments. For financial gains and medical losses, self-other differences with small outcomes were magnified with large outcomes. There were no self-other differences for financial losses or medical gains. More work is needed to understand these domain differences.

Paper 3 turned to the decision process in financial and medical decisions by looking at the relationship between surrogate predictions and surrogate decisions across three experiments. Although there were mean discrepancies between surrogate predictions and choices, we identified a predictive relationship between the two in both domains.

Paper 4 focused on medical decisions to test the hypothesis that accountability reduces risk-taking for others relative to the self by manipulating the information presented to participants while they made decisions. We found weak evidence for the accountability hypothesis and suggest that more sophisticated methodologies are needed to understand the surrogate decision process.

Paper 5 took a different approach by using a mixed methodology. Older adult partners completed an end-of-life decision task and took part in an interview about their decision process. We found that surrogates intended to make a decision that their partner would have made for themselves, but also considered other factors. Previous discussions with their partner seemed to help them decide.

Paper 6 explored whether factors that seemed to help surrogates make decisions in Paper 5 increased their likelihood of deciding according to their partner's wishes. Older adults were more likely to do so. Those who had previous discussions with their partner felt more confident that they made the right decision, which suggests that encouraging discussions about end-of-life among families would ease the decision process.

This thesis has made valuable contributions to our understanding of surrogate decisions by bringing together literatures across disciplines. It has expanded the field by proposing and testing novel hypotheses, while also evaluating existing theories. Useful methodological insights and new research avenues were identified, which can continue to carry the field forward.

Acknowledgment

There are many people without whom this thesis would not be what it is. It certainly could not have happened without Richard Tunney introducing me to surrogate decision making and passing on his enthusiasm for the field. His carefully considered supervision allowed me to develop my own thinking and approaches, while receiving the wisdom I needed to progress successfully. I am hugely grateful for his invaluable support throughout – even after leaving Nottingham – and can gladly say it has been a pleasure.

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Declaration

I can confirm that the work that has gone into the papers that make up this thesis is my own, under supervision by my co-authors Richard Tunney and Eamonn Ferguson. I am first-author on all six papers and it is the norm in Psychology for supervisors to be co-authors.

Contents

Chapter 1: Introduction

The ways in which we make decisions for ourselves has been extensively studied by an array of disciplines, allowing them to come to a thorough understanding of the processes involved. On the other hand, the decisions we make for other people – surrogate decisions – have received much less attention. This is surprising given that they constitute a significant amount of our daily decisions. Our social interactions are filled with such instances: buying a gift for a friend, selecting a school for a child, planning a trip for a loved one. They are also required by numerous professions: physicians for their patients, managers for their employees, politicians for their citizens. These decisions present themselves in many shapes and forms with consequences that can be life-changing, making their study of great importance.

Other than their prevalence, the increased difficulty inherent in making a decision that is for somebody else highlights the need for their investigation. The uncertainty contained in a decision is magnified by the fact that the decision-maker has to do so without complete knowledge of what the recipient (the person who the decision is being made for) would want, or in the absence thereof. Another layer of complexity is added to the process whereby the decision-maker has to make a judgment about the course of action favoured by the recipient. Of course, the decision-maker might not want or need to consider the recipient's preferences, but rather go down the most optimal path when the circumstances call for the best possible outcome. In such cases, having to decide for somebody else heightens the responsibility placed on the decision-maker, thereby intensifying the burden a decision can hold.

With this in mind, the intention of this thesis was to construct an understanding of the ways in which we make surrogate decisions, by comparing them to the decisions we make for ourselves. This enabled me to put the above intuitions to the test in order to advance this promising field of study. Given the range of domains surrogate decisions can span, I chose to

restrict my analysis to the medical and financial domains, which allowed me to bring together literatures from different disciplines. I focused the empirical investigations on decisions that involve a clear risk component (i.e. choices with at least one probabilistic option) in order to clearly build on previous work in the area. Note that I consider a decision to be the whole process leading up to acting upon a given situation, in which can appear a choice between particular options.

To further contextualise this work, I will provide an account of the real-world situations in which medical and financial surrogate decisions are made. I will then present the theoretical backdrop to my work and detail the psychological theory I drew on throughout. Next, I will examine previous empirical studies of surrogate decisions involving risk in the medical and financial domains. Finally, I will provide an overview of the work I conducted to introduce the series of papers that constitute the present thesis.

1.1. The real-world context of surrogate decision making

1.1.1. Medical decision makers

It is not uncommon for patients to lose their decision-making capacity to illness or injury, meaning that they are no longer considered competent to make their own decisions. These occurrences are predicted to rise in the context of an ageing population – the number of people living with dementia is expected to triple by 2050, thereby affecting 150 million people worldwide (World Health Organization, 2017). In light of the importance attributed to patient autonomy in health care (British Medical Association, 2018), measures are put in place to ensure that the patient's values and wishes are respected when medical decisions are made for them. The particular legislation varies across countries, but it is often the case that a surrogate decision-maker will have to make a decision on behalf of the patient. For example, more than 70% of deaths in the intensive care unit in the US are the result of a decision to withhold or

withdraw life-sustaining treatment or to not pursue resuscitation attempts (Radwany et al., 2009). Ninety-five percent of those patients will have lost their decision-making capacity, meaning that family members will most likely be called upon to make those decisions. If the patient has not previously designated a surrogate (by power of attorney for example), the next-of-kin is usually legally appointed to take on that role.

The ethical framework of surrogate decision-making that was developed three decades ago largely prevails today (Buchanan & Brock, 1990). If an advance healthcare directive has been written by the patient, where their treatment preferences are stated, it should be followed. If this is not the case, which is the norm rather than the exception, the decision is deferred to a surrogate. Indeed, it is estimated that only a third of US adults have made advance care plans (Yadav et al., 2017), and that across the East Midlands (UK), about a fifth of older adults have done so (Musa, Seymour, Narayanasamy, Wada, & Conroy, 2015). In these circumstances, the surrogate is expected to follow the substituted judgment standard, which instructs them to make the decision that the patient would have made if they were able to do so. The need for a next-of-kin to act as a surrogate becomes clear, as they are presumably the most informed about the patient's wishes. However, in the absence of knowledge of the patient's wishes, the best interests standard is applied, whereby the path that is predicted to yield the best outcome for the patient is chosen. In the UK, the Mental Capacity Act of 2005 stipulates that surrogates should make a decision that is in the patient's best interests, which is defined as protecting the patient, but also considering their wishes, beliefs and values. In other words, it asks surrogates to follow both the substituted judgment standard and the best interests standard as conceptualised by the original ethical framework.

Surrogates are not the only ones who are tasked with making decisions for other people in a medical context. When a patient has lost their decision-making capacity, medical professionals are not entirely excluded from the decision process, even though they might not

be the ones making the final decision *per se*. When the best interest standard needs to be applied, they are often called upon to determine what that would be. In cases of emergency where it is not possible to consult an advance directive or any family member, medical professionals are expected to not delay treatment if that could pose a serious risk to the person's health (British Medical Association, 2007). Moreover, although the aim is for shared decision-making to become the norm, physicians do end up making decisions for their patients at various points throughout their decision process (Garcia-Retamero & Galesic, 2012). They are likely to be selective in the treatment options they present to patients and tailor their advice to the circumstances and their knowledge of the patient's wishes. Even though medical professionals might not have the final say, they have a heavy influence on the process. In fact, many patients do not want to make the decision and would rather their physician make it for them, meaning that medical professionals end up making a significant number of decisions in reality (Hanson, 2008).

1.1.2. Financial decision makers

Individuals who have lost their decision-making capacity will also require help with making financial decisions. This issue has received attention in recent years given the high prevalence of financial exploitation of older adults (Black, 2008). Financial advisers have been encouraged to look out for it (Lichtenberg, 2016). To reduce the risk of financial exploitation, the person in question can appoint someone through power of attorney. This means that appointee will be granted the ability to make financial decisions on their behalf (managing their bills, accounts, property etc). As the number of people registering Lasting Power of Attorneys is sharply rising in the UK (Gallagher, 2016), the interest for understanding the process by which these decisions are made is too.

Professions in the financial sector also involve making decisions involving risk with other people's money, such as fund managers making investments with their client's money or bank managers handling depositors' money. Many claims have been made about these agents taking excessive risks. It is generally accepted that excessive risk-taking by financial professionals was a causal factor in the financial crisis of 2007-2008 (Eriksen, Kvaløy, & Luzuriaga, 2017). This issue is still on the agenda today. Bank managers gain from the bank's profits if it does well, but face minimal losses if it fails, which encourages them to take risks that can have detrimental consequences (Koudijs, Salisbury & Sran, 2018). There is in fact a correlation between these incentives and excessive risk-taking by banks (Bhagat & Bolton, 2014). It is likely that these agents would not be willing to take the same risks with their own money, as they would be the ones incurring the losses.

1.2. Psychological theories of surrogate decision making

1.2.1. Theories rooted in cognition

Surrogate decisions differ from the ones we make for ourselves in that the decision-maker, who is not the recipient of the decision, is distant from the outcome. Construal-level theory (Trope & Liberman, 2010a) conceptualises psychological distance as varying along four dimensions: time, space, probability and social. It proposes that we are capable of transcending our immediate egocentric experience and form representations of psychological distant objects. It predicts that we do so by forming abstract mental construals of distant objects, meaning that they become more abstract as psychological distance increases. The implications for surrogate decisions are that they are thought of in a more abstract manner than our own decisions, and that this becomes increasingly so as the social distance between the decision-maker and the recipient increases. It would then follow that if our surrogate decisions differ from our own decisions, this difference would be accentuated as the recipient becomes more distant from the

decision-maker. This difference in abstract and concrete thinking might push people to consider the more long-term impact of a decision for others as opposed to its more immediate impact for themselves. In the case of risky decisions, it has been found that people are more likely to choose a probabilistic option for future gains than for present gains (Savadori & Mittone, 2015). It is therefore conceivable that people would also be more willing to choose a probabilistic option for others than themselves.

The egocentric anchoring and adjustment model of perspective-taking (Epley, Keysar, Van Boven, & Gilovich, 2004) makes similar predictions to construal-level theory. It assumes that we take others' perspectives by serially adjusting from our own, particularly in cases where we are less familiar with the other and must infer their perspective. We would therefore perceive another's perspective to be increasingly different from our own the further away they are from us. We can transpose this to surrogate decisions to form the prediction that they systematically deviate from people's own decisions as the psychological distance between the decision-maker and the recipient increases. By doing so, we would be assuming that surrogate decisions are made in line with surrogate predictions – that we decide according to what we think the recipient would do for themselves. Both construal-level theory and the egocentric anchoring and adjustment model make clear predictions concerning the relationship between the surrogate and the recipient, but they do not speak to any potential difference between decision domains.

1.2.2. Theories rooted in emotion

The distance that is created between the surrogate and the recipient can also be referred to as an empathy gap (Loewenstein, 1996). Given that the surrogate is not receiving the outcome of the decision, they are expected to be less emotionally involved in its outcome. This empathy gap would lead to a reduced influence of emotions on the decision process. Decision-

makers are also expected to underestimate the emotional experience of the recipient and might take it into account less when choosing for others than for themselves. For example, physicians would under-medicate a patient because they are not able to appreciate the extent of their pain due to them being in a cold, pain-free state (Loewenstein, 2005). In the case of financial decisions, surrogates would underestimate the recipient's emotional reactions to a gain or loss. Finally, the empathy gap predicts that decisions for others increasingly deviate from those made for the self as the gap widens.

The empathy gap can also make predictions about surrogate decisions under risk in conjunction with the risk-as-feelings hypothesis. The hypothesis posits that our risk preferences (whether we are risk-averse or risk-seeking) are the result of our emotional reactions to the risk, rather than a purely cognitive evaluation of it (Loewenstein, Weber, Hsee, & Welch, 2001). In a surrogate context, if the decision-maker is less emotionally involved in the decision due to an empathy gap between them and the outcome, it would follow that their own risk preferences would be attenuated. If they are risk-averse for themselves they would be less risk-averse for others, and if they are risk-seeking for themselves they would be less risk-seeking for others. In other words, surrogate decisions would be closer to risk-neutrality. Again, this would become increasingly the case as psychological distance between the surrogate and the recipient increases. These emotion-based theories make similar predictions to cognitive-based theories regarding the relationship between the decision-maker and the recipient, but again do not make claims concerning any potential differences between decision domains.

1.2.3. Theories rooted in social factors

The theories I have presented so far do not address the impact that social factors can have on surrogates' decision-making. On the other hand, social values theory posits that surrogate decisions under risk will be predominantly influenced by social values, unlike our own

decisions (Stone & Allgaier, 2008). The decision-maker is thought to follow a norm rather than considering a host of factors. It is predicted that differences between our own and surrogate decisions will arise if there is a social value placed on risk-taking. If there is no clearly valued behaviour, there is less reason for decisions for others to deviate from those made for the self. The social value placed on risk is likely to differ according to the context of the decision: risk-aversion might be valued on a maternity ward but not in a casino. Social values theory therefore predicts that the difference between our own and surrogate decisions will be context-dependent. By understanding the social value placed on risk, social values theory can make predictions regarding the way in which they will differ. On the other hand, it does not speak to the relationship between the decision-maker and the recipient. It is conceivable that if the surrogate knows the recipient well, they might be inclined to decide based on that knowledge rather than follow a social norm.

Finally, it has been conjectured that the responsibility for somebody else's welfare leads decision-makers to being more cautious than when deciding for themselves (Charness & Jackson, 2009). The responsibility is presumed to induce pro-social behaviour which would then result in less risk-taking. It predicts that more important decisions increase that feeling of responsibility and lead to a further decrease in risk-taking. Although it does not make specific predictions about the relationship between the surrogate and the recipient, that responsibility might increase if the recipient is close to the surrogate, who would then feel more involved in their welfare.

1.2.4. Tunney and Ziegler's model (2015) of surrogate decision-making

Although the above theories allow us to make predictions about how our surrogate decisions might differ from our own, their claims are restricted when it comes to understanding the complexity and variability of surrogate decisions. Each theory identifies a specific element

of the decision to which is attributed the explanation of when self-other differences arise. Tunney and Ziegler's model (2015), on the other hand, provides a more comprehensive account of surrogate decision-making and a framework by which they can be discussed. Like other theories, it does not assume that we possess decision-making processes that are specific to surrogate decisions, but only that the change of perspective from making a decision for oneself to someone else affects the decision process. It can therefore make predictions about when self-other difference might arise. Additionally, it gives more insight into the decision-makers' thought process and conceptualises it as more reflective than previous theories. In addressing a variety of factors that influence the decision process, it is better suited to understanding real-world decision-making which can be full of complexity.

The model assumes that we engage in various forms of perspective-taking when making a surrogate decision, which can fall into four categories. The surrogate can take a *simulated* perspective, where they attempt to decide according to the recipient's preferences – in other words, doing what the recipient would have done for themselves. This is the expectation of the substituted judgment standard in medical decisions. The surrogate can take a *benevolent* perspective, where they seek to make a decision that has the best possible outcome for the recipient. This requires them to make a judgment about the utility of the outcomes, irrespective of the recipient's wishes, thereby corresponding to the best interest standard in medical decisions. The surrogate can take a *projected* perspective, where they decide according to what they would have done for themselves in that situation. They imagine themselves in the recipient's situation but might not appreciate that the surrogate would want something different. Finally, the surrogate can take an e*gocentric* perspective, where they decide based on what they want for the recipient, thereby maximising their own utility rather than the recipient's. In this case, the surrogate decides according to selfish motives.

Surrogates are expected to compute all four perspectives and their respective outcomes, particularly when decisions require more thought. In the case that these perspectives concur, the choice is already made. Otherwise, the decision-maker has to somehow choose between these perspectives. The model proposes a choice rule whereby the perspective selected is the one which is attributed the most weight, which depends on a range of factors. These biasing factors are features that are internal or external to the decision-maker and influence the decision-maker's perspective-taking by affecting the weight attributed to each. If the surrogate has the *intention* of taking a particular perspective, that perspective is likely to be heavily weighted. This should happen when the surrogate is instructed to follow the substituted judgment standard or the best interest standard. The *calibration* between the surrogate and the recipient, i.e. how well they know each other, is expected to affect the surrogate's propensity to take a simulated perspective. The surrogate would rely on a simulated perspective if they know what the recipient wants, but would defer to a projected perspective if they do not. Individual differences in *empathy* as the ability to take on another's perspective should also influence the surrogate's propensity to make a simulated decision. Those who are better able to set aside their own perspective and understand that others can have different preferences are more likely to do so than those who lack the capacity to see beyond their own. The *significance* of the decision, i.e. the impact of the outcome to the recipient, is expected to affect the level of thought that the surrogate will put into it. Highly significant decisions should lead surrogates to evaluate all four perspectives, whereas they might defer to the most convenient in the case of trivial decisions. Finally, the *accountability* held against the surrogate should affect the decision process. Trivial decisions would not usually require a justification, unlike important ones which might even require justification in a judicial setting. If accountability is high, decision-makers are likely to conform to the required perspective, such as the substituted judgment standard. Otherwise, the perspective they rely on will depend on their intention.

Tunney and Ziegler's (2015) model makes several predictions that extend beyond those made by previous theories. The relationship between the surrogate and the recipient is acknowledged, but the predictions made surpass the simplistic assumption that larger psychological distance will lead to larger self-other differences and instead proposes that its effect will depend on other features of the decision. It makes sense that for a trivial decision, the surrogate might simply adjust their own decision in proportion with the psychological distance between them and the recipient. For more consequential decisions, other perspectives might be computed which leads to a more complex decision process. Although the model does not explicitly speak of social values, it is conceivable that they strongly align with the predictions made in relation to accountability. If the surrogate is required to justify their decisions to an external other, it would make sense to defer to what is socially valued in that situation, which could be the required benchmark. However, the model does not allude to social values in the case of more trivial decisions. Finally, the presumed interactions between accountability and significance are close to those assumed by the responsibility hypothesis. More significant decisions will push the surrogate to be more cautious, which is also an approach that might be more defensible under accountability. Given the explanatory power of Tunney and Ziegler's (2015) model, it constitutes the predominant theoretical framework that will guide our analysis of surrogate decisions throughout this thesis.

1.3. Previous studies of surrogate decision making

1.3.1. Medical domain

A considerable amount of work has been put into trying to understand whether the substituted judgment standard is achievable in practice, mainly by health disciplines. In terms of the decision process, the substituted judgment standard assumes that surrogates are able to do two things. Firstly, that they can accurately predict the patient's wishes, which requires them

to have sophisticated knowledge of the patient and an ability to take their perspective. Secondly, that once they have predicted the patient's wishes, they are able and willing to make the decision accordingly, irrespective of their own or anyone else's wishes. In terms of the first one, there is a body of evidence which suggests that this is not the case, as revealed by a systematic review which estimated surrogate accuracy at 68% (Shalowitz, Garrett-Mayer, & Wendler, 2006). This does not seem to be impacted by measures which would be expected to increase surrogate accuracy, such as how the surrogate was designated (patient-designated or legally appointed) or previous discussions with the patient. Furthermore, there is evidence that, when predicting what another person would want, people tend to project their own treatment preferences onto them, which then leads to surrogate inaccuracy (Fagerlin, Danks, Ditto, & Houts, 2001; Marks & Arkes, 2008; Raymark, 2000). A number of criticisms have therefore been launched against the use of the substituted judgment standard (Torke, Alexander, & Lantos, 2008).

In terms of the second assumption, qualitative reports of the experiences of surrogate decision-makers highlight that the process is a lot more complex in reality, where the patient's wishes are overshadowed by priorities such as preserving the patient's life or the family's well-being (Dionne-Odom, Willis, Bakitas, Crandall, & Grace, 2015; Fetherstonhaugh, McAuliffe, Bauer, & Shanley, 2017; Schenker et al., 2012). Furthermore, experimental evidence suggests that we make different decisions for others than we do for ourselves, despite the fact that we project our preferences onto them. This suggests that there is a discrepancy between our surrogate predictions and decisions.

Indeed, the evidence overwhelmingly shows that we take less risk when making decisions for others than for ourselves in hypothetical treatment scenarios (we are more likely to have others vaccinated or treated for example). This has been found when medical professionals make decisions or recommendations for patients (Garcia-Retamero & Galesic,

2012; Janssen et al., 2015; Ubel, Angott, & Zikmund-Fisher, 2011), but also when ordinary decision-makers do so for a relative or a hypothetical patient (Carroll, Saha, Ofner, & Downs, 2017; Dore, Stone, & Buchanan, 2014; Oliver, 2013; Tang, Shahab, Robb, & Gardner, 2016; Zikmund-Fisher, Sarr, Fagerlin, & Ubel, 2006). Although most studies suggest that decision-makers take less risk for others by having them vaccinated or treated more often, there is also evidence of the contrary. Surrogates are less likely to choose a treatment that carries a risk of death for others, even if that might mean leaving the patient with a severe condition (Carroll et al., 2017) or selecting a treatment with a higher risk of complications (Ubel et al., 2011). In fact, the common denominator in these studies seems to be that surrogates favour the option that carries the lowest risk of the recipient dying, which is conceptualised as the less risky option, irrespective of whether it is the treatment or the non-treatment option. This suggests that there is a strong norm towards keeping a patient alive when making decisions for others, which is in line with social values theory (Stone & Allgaier, 2008).

These findings have generally been interpreted as surrogates being more cautious for others, similarly to the responsibility hypothesis (Charness & Jackson, 2009). Surrogates might favour a cautious approach due to the need to justify their decisions (i.e. accountability), in which case avoiding a risk of death might be easier to defend. In fact, when doctors were asked to justify their decisions, almost all reported a fear of legal consequences, which has been linked to the rise in litigations against doctors (Garcia-Retamero & Galesic, 2012). This clearly shows the impact of accountability on their decision process. In the case of ordinary decision-makers, its role has been discussed but not formally tested. It would make sense that they would feel accountable towards the patient and their family. When deciding for a relative, they might take a more cautious approach out of fear of losing them, thereby making an egocentric decision. This would suggest that surrogates are not taking a simulated perspective when

deciding for others in treatment scenarios, which goes against the aims of the substituted judgment standard.

There is also evidence of discrepancies between surrogate predictions and surrogate decisions. Medical professionals take less risk for patients, despite predicting that patients would either be equally or more risk-taking than them (Garcia-Retamero & Galesic, 2012). In safety scenarios, it has been found that people are more cautious on behalf of their friend, even though they predict their friend would make similar decisions to them (Stone, Choi, de Bruin & Mandel, 2013). Although these are useful in showing that surrogates do not necessarily follow a simulated perspective, both studies used a between-subjects design and could not assess whether surrogate predictions had an influence on surrogate decisions. On the other hand, a study found that participants were less likely to have themselves vaccinated than a hypothetical younger sister they were responsible for, irrespective of whether they were told that the sister would favour vaccination or not (Petrova, Garcia-Retamero, & Van Der Pligt, 2016). This suggests that surrogates might be willing to override the recipient's decision to make a more cautious one on their behalf. Nevertheless, the self-other difference was larger when the sister was favourable to treatment than when she was not, implying that they did not completely disregard her preferences. More work is needed to understand how and when surrogates integrate the recipient's preferences into their decision-making. Depending on the situation, it could be that they do not think about their preferences, that they compute them but choose to disregard them, or that they incorporate them in their decision alongside other factors.

1.3.2. Financial domain

Unlike the medical domain, experimental work looking at self-other differences in financial decisions involving risk do not present a clear picture. Several studies from psychology and behavioural economics have found that people take more risk for others than

they do for themselves (Batteux, Ferguson, & Tunney, 2017; Mengarelli, Moretti, Faralla, Vindras, & Sirigu, 2014; Pollmann, Potters, & Trautmann, 2014; Polman, 2012; Sun, Liu, Zhang, & Lu, 2016). On the other hand, some have found that people take less risk for others (Eriksen & Kvaløy, 2010; Füllbrunn & Luhan, 2015; Reynolds, 2009) or do not report self-other differences (Eriksen et al., 2017; Stone, Yates, & Caruthers, 2002). Several accounts of self-other differences have been proposed: risk-as-feelings hypothesis (Fernandez-Duque & Wifall, 2007), reduced loss aversion for others (Polman, 2012a), responsibility hypothesis (Eriksen & Kvaløy, 2010). However, the literature has not been able to explain the discrepancies in findings. Contradictory results have been reported in both within-subjects designs (Batteux et al., 2017; Reynolds, 2009) and between-subjects designs (Eriksen & Kvaløy, 2010; Polman, 2012a). They have also been found in studies using similar tasks (investment task for example: Eriksen & Kvaløy, 2010; Pollmann et al., 2014) and in both studies with real choices (Batteux et al., 2017; Füllbrunn & Luhan, 2015) and hypothetical choices (Eriksen et al., 2017; Sun et al., 2016).

Although studies have found that self-other differences increase as psychological distance between the decision-maker and the recipient increases (Batteux et al., 2017; Sun et al., 2016; Zhang, Liu, Chen, Shang, & Liu, 2017), the identity of the recipient on its own cannot explain discrepancies in findings. They appear when decisions are made for both a stranger (Eriksen & Kvaløy, 2010; Pollmann et al., 2014) and a close other (Füllbrunn & Luhan, 2017; Reynolds, 2009). On the other hand, the risk preference of the decision-maker looks more promising. In studies looking at framing effects, people are risk-averse in a gain frame but less for others, and risk-seeking in a loss frame but less so for others (Zhang et al., 2017; Ziegler & Tunney, 2015). This trend whereby people make decisions that are closer to risk-neutrality for others has also been found in a study that compared risk-averse to risk-seeking participants (Batteux et al., 2017). Interestingly, most of the studies that found that people are less risk-

averse for others involved a gain situation (Batteux et al., 2017; Mengarelli et al., 2014; Polman, 2012a; Sun et al., 2016), whereas most of those that found that people are more risk-averse for others, or no self-other differences, involved a gain situation with a potential loss (Eriksen & Kvaløy, 2010; Eriksen et al., 2017; Füllbrunn & Luhan, 2015). If the discrepancies in findings can be explained by this, it would lend support to the risk-as-feelings hypothesis.

The question regarding the relationship between surrogate predictions and decisions has received less attention than in the medical domain, presumably given the ethical requirements of medical decisions. Nonetheless, a few studies have investigated whether our predictions of others' risk preferences differ from our own and have found that we predict others to be more risk-neutral than ourselves (Faro & Rottenstreich, 2006; Hadar & Fischer, 2008; Hsee & Weber, 1997; Krishnamurthy & Kumar, 2002). Notably, this perceived difference between our own and others' preferences varies with psychological distance, whereby it weakens when the recipient is closer to the recipient (Faro & Rottenstreich, 2006; Hsee & Weber, 1997). Self-other differences in predictions appear to follow a similar pattern to self-other differences in decisions. This finding suggests that people might decide according to the recipient's preferences, but it cannot draw any conclusions about whether surrogates do engage in a simulated perspective. More work is needed to understand how surrogate decisions are made in the financial domain.

1.4. Thesis overview

1.4.1. Aims of the thesis

This thesis fills gaps in the literature to advance our understanding of surrogate decisions involving risk in the medical and financial domains. The research question that has dominated experimental work so far is whether our risk preferences change when we make decisions for other people. This thesis aims to make a significant contribution by going one step further and

identifying the specific contexts in which risk preferences change and investigating the decision process that gives rise to these self-other differences. As previously mentioned, given the variety of forms surrogate decisions can take, I made a number of choices concerning the way in which I designed my studies. I restricted them to scenarios in which an individual is asked to decide behalf of another individual. I did not address the differences between giving advice to someone and making a decision for them. I focused on situations where the surrogate is an ordinary decision-maker and therefore did not investigate professional decision-making. I did not conduct studies where decisions were made by groups or on behalf of groups, nor where the surrogate could confer with the recipient. I focused on decisions with a risk component, meaning that all studies involved making a series of choices between a safe option and a risky option, or two probabilistic options. Finally, I focused on financial and medical decisions to build on previous research in both fields. I chose the financial domain in order to work through the inconsistencies and the medical domain given the weight of its real-world implications. My work in the medical domain was therefore more applied than my work in the financial domain.

In the medical domain, the literature is coherent and self-other differences are clear. I could therefore move on to explaining why they occur. Given the attention that their real-world context has received, I aimed to examine the practical implications of my findings. In particular, I worked on the second assumption of the substituted judgment standard to shed light on how surrogates incorporate the recipient's preferences into their decision-making. My work extended beyond laboratory experiments in order to construct a richer and deeper understanding of the complexities of these decisions. I drew from Tunney and Ziegler's (2015) model to investigate the perspectives that surrogates take and how this varies according to particular features of the decision.

In the financial domain, the inconsistencies in findings needed to be explained. The risk-as-feelings hypothesis looked like a promising avenue which I chose to explore. Previous studies had largely focused on identifying the outcome of surrogate decisions, and how they differ from the self, rather than their process. I aimed to shed light on the discrepancies in self-other differences before I started to elucidate the surrogate decision process. In other words, figure out what people do before explaining why. My analysis of financial decisions was confined to laboratory experiments, using a methodology akin to that of behavioural economics. I drew from Tunney and Ziegler's (2015) model to investigate how the particular features of a decision affect self-other differences.

Although my aims for each decision domain differed, I also wanted to compare medical and financial decisions. Previous studies had been specific to either domain and often conducted within their respective disciplinary fields (i.e. health and economics). The question of whether they are comparable remained open to investigation. It could be that any differences between medical and financial decisions can be explained in terms of their specific features rather than an overarching domain difference, which is the assumption made by Tunney and Ziegler's (2015) domain-general model and most other accounts of self-other differences. However, it could be that they are not comparable given particular social values that prevail in each domain for example. Furthermore, the relative absence of inconsistencies in the medical domain could perhaps shed light on why there are inconsistencies in the financial domain.

I approached surrogate decisions from the angle of self-other differences, in keeping with previous research. This allowed me to easily compare my work to it, but also to draw on the extensive research that has been conducted on how people make decisions for themselves. My analysis mainly rested on Tunney and Ziegler's (2015) account of surrogate decision-making, both in the way that I designed and interpreted my studies, thereby putting its predictions to the test. It made sense to do so given that it is better able to understand the complexities of the

surrogate decision process than other accounts, while at the same time incorporating them within its model. However, I also drew from other accounts which at times make clearer predictions about the direction of self-other differences.

1.4.2. Rationale for each paper

Given the discrepancies in the literature, I conducted a meta-analysis of studies on self-other differences in risk preferences in **Paper 1**. This allowed me to test my predictions concerning factors that affect self-other differences. I compared self-other differences between domains (financial, medical, interpersonal[1]) to formally assess our assumption that self-other differences vary between domains given their diverging findings. That distinction is not necessarily made by theories of surrogate decision-making and was therefore worth interrogating. I tested the hypothesis that the frame of the decision affects the direction of self-other differences and examined whether calibration (or psychological distance) moderates self-other differences. I also assessed whether self-other differences are affected by various methodological factors. One caveat to this meta-analysis was that studies in the financial and medical domain varied in terms of significance: financial studies used relatively small outcomes, whereas medical studies used scenarios which often referred to a possibility of death. There was therefore a need to investigate whether outcome magnitude could account for any domain differences.

In **Paper 2**, I explored how the frame and significance of the decision affect self-other differences in each domain. In the financial domain, there had not been studies that had compared small to large outcomes in a surrogate context. This is particularly problematic given that many studies in behavioural economics were motivated by the need to explain excessive

[1] There are a few studies that have investigated self-other differences in interpersonal scenarios. I did not choose to address them in this thesis, but I did include them in the meta-analysis in order to conduct a comprehensive review of the literature.

risk-taking leading up to the financial crisis, and yet used small outcomes in their studies. In the medical domain, there have been studies that used vaccination scenarios (which can be considered as a gain frame) and others that used treatment scenarios (loss frame), but the two had not been directly compared. Similarly, scenarios have varied in terms of the severity of the illness they depict but its effect had not been tested either. With this in mind, I conducted three experiments. Experiment 1a looked at the effects of frame and outcome magnitude on financial decisions. Experiment 1b was designed to replicate the small outcome magnitude condition of Experiment 1a with performance contingent-payments to assess whether that affected its results. Finally, Experiment 2 looked at the effects of frame and outcome magnitude on medical decisions.

In **Paper 3**, I started to move away from focusing on decision outcomes in order to further investigate the decision process by looking at the relationship between surrogate predictions and surrogate decisions. I explored whether surrogates took a simulated perspective by experimentally looking at whether predictions were predictive of decisions. This allowed me to assess whether their similarities in the financial domain implied that decisions were based on predictions. Experiment 1 compared predictions to decisions in the financial domain and Experiment 2 compared predictions to decisions in the medical domain. Experiment 3 investigated whether this relationship differed between decision domain by investigating predictions and decisions in financial and medical scenarios. Overall, I found that self-other differences in predictions can account for some of the variability in decisions in both domains.

In **Paper 4**, I sought to investigate whether accountability can also account for some of the variability in medical self-other differences to test the conjectures made by the literature. I hypothesised that the accountability felt by decision-makers, which would lead them to be more cautious for others, could come from two sources: having to face the recipient's family or any legal repercussions. I conducted an experiment which made each source of accountability

salient to different groups of participants while they made medical decisions, on the assumption that this would accentuate self-other differences. I did not find conclusive evidence for the accountability hypothesis. However, I did find that decision-makers were thinking about the consequences to the recipient's family when deciding for them.

I decided to take a different approach in **Paper 5**. Instead of experimentally testing the assumptions I was making about the decision process, I turned to qualitative methods to construct an understanding from what surrogates report about the process. In-depth interviews were a much better way of capturing its nuance and complexity than the experimental methods I had been using. I also wanted to investigate medical decisions from a more realistic angle in order to make more constructive claims about real-world surrogate decisions. To this end, I recruited older adult partners (my studies so far had focused on young adults). In keeping with my previous work, I asked them to complete a task which involved making end-of-life decisions for them and their partner. I changed the scenarios I had previously used to ones that were more representative of real medical decisions. I then interviewed participants to discuss their decision process, which were analysed using a thematic analysis guided by Tunney and Ziegler's (2015) model. In doing so, I was able to understand the perspectives that surrogates take and identify a number of factors that influence their propensity to make a simulated decision.

In **Paper 6**, I explored whether the factors I identified in our previous paper can predict the likelihood that surrogates make a simulated decision for their partner. I was interested in finding out whether surrogates' acceptance of mortality and their previous discussions with their partner had an impact on the decision process. Given that I expected these factors to vary with age, I recruited a large sample of participants across the adult life span. This also allowed me to investigate any age-related differences in decision-making, which I had not addressed so far. I asked participants to make end-of-life decisions for themselves and for their partner, as

well as predict what their partner would do for themselves. They also completed a series of questionnaires designed to capture the variables I was interested in. This gave me insight into their decision process that spanned beyond previous theories of surrogate decision-making. Given their specificity to end-of-life surrogate decisions, I was able to draw more fine-tuned conclusions about the practical relevance of my findings.

Paper 1

Do our risk preferences change when we make decisions for others? A meta-analysis of self-other differences in decisions involving risk

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RESEARCH ARTICLE

Do our risk preferences change when we make decisions for others? A meta-analysis of self-other differences in decisions involving risk

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Abstract

Background

Are we more risk-averse or risk-seeking when we make decisions on behalf of other people as opposed to ourselves? So far, findings have not been able to provide a clear and consistent answer.

Method

We propose a meta-analysis to assess whether self-other differences vary according to particular features of the decision. We reviewed 78 effect sizes from 49 studies (7,576 participants).

Results

There was no overall self-other difference, but there were moderating effects of *domain* and *frame*. Decisions in the *interpersonal* domain were more risk-averse for self than for other. Decisions in the *medical* domain were more risk-seeking for self than for other. There were no overall self-other differences in the *financial* domain, however there was a moderating effect of *frame*: decisions in a *gain* frame were more risk-averse for self than other whereas decisions in a *loss* frame were more risk-seeking for self than other. This effect of *frame* was slightly different overall and in the medical domain, where self-other differences occurred in a *loss* frame but not in a *gain* frame.

Conclusion

Future work should continue to investigate how the specific content and context of the decision impacts self-other differences in order to understand the effects of *domain* and *frame* we report.

Competing interests: The authors have declared that no competing interests exist.

Introduction

Background

The question addressed by the present meta-analytic review is the following: are we more risk-averse or risk-seeking for others compared to the self and is this context-dependent? The prospect of a risk is integral to the decisions we are faced with every day, meaning that investigating how people comprehend and react to the prospect of a risk is crucial to understanding the decisions they make. Although such research has largely focused on decisions that people make for themselves, there is a growing interest in investigating the decisions that people make on behalf of others (from individuals to societies)–surrogate decisions [1,2]. Indeed, we frequently make decisions for other people, such as buying a present for a loved one or preparing meals for our family. A range of professionals are also required to make risky surrogate decisions on a daily basis: doctors when selecting treatments for their patients for example. On a larger scale, financial investors and institutions often make risky decisions for other people which can have a role in global economic crises. The present meta-analysis provides an overview of the research to date, guided by Tunney and Ziegler's [3] model of surrogate decision-making which allows us to bring some order to the literature and reframe it into a coherent, unifying account of self-other differences in risky decision-making.

Defining key terms. In keeping with the literature on self-other differences, we define a risky choice as having to decide under uncertainty, whereby at least one of the options contains a risky outcome. Risk can be expressed as a clear probability (e.g. 50% of chance of winning £100) or as an uncertain outcome (e.g. asking out a prospective partner). We do not conceptualise risk as necessarily denoting harm as other definitions might do [4]. For the purpose of this review, we establish surrogate decisions as involving on the one hand a decision-maker–the surrogate–and on the other a recipient–the person or people on behalf of which the surrogate is making a decision. We consider surrogate decisions as cases in which the recipient has no say in the decision process; it is not a negotiated decision. The recipient has no choice and accepts the outcome of the decision made by the surrogate. Decision-makers can vary in their relationship to the recipient, but in all cases, they make a decision for a recipient who is generally passive. There are cases of surrogate decision-making where the recipient and other parties are involved in negotiating the outcome, but this is a different type of decision and one we will not address here. We will also be confining our review to instances where the decision-maker actually makes a choice on behalf of the recipient, rather than giving advice or predicting their decisions.

Although the first few studies on self-other differences in risky decision making can be traced back to fifty years ago [5–7], there has been recent increased interest, particularly in the field of behavioural economics, linked to the involvement of such decisions in the financial crisis [8–10]. In the psychological literature, interest in surrogate decisions has grown against the backdrop of a long-standing interest in the role that emotions play in our decision-making [11–13]. In the medical field and particularly end-of-life care, the question has become of importance since reports that surrogate decision makers struggle to make accurate choices for their relatives [14]. However, results have often been contradictory, which may reflect the domain in which surrogate decisions are made and their impact on the decision-maker and recipient, amongst other factors. This means that there is no straightforward answer regarding whether we take more risk or less risk when we make decisions on behalf of other people as opposed to ourselves. The aim of this meta-analysis is to identify potential factors which contribute to the discrepancies in findings. Although a meta-analysis of self-other differences has been previously conducted [15], it only included studies prior to 2012 and is therefore missing a significant proportion of the literature. We wish to build on this review by using Tunney and Ziegler's [3] model as a framework to guide our analysis.

Theories and models of surrogate decision-making

Tunney and Ziegler's [3] model of surrogate decision-making suggests a number of factors which may alter or bias the decision process that are of interest here. The identity of the recipient–who the decision is being made for–is expected to have an impact on the decision process. In effect, surrogate choices have been found to vary systematically from choices made for the self as psychological distance between the decision-maker and the recipient or outcome increases [16–18]. The significance or importance of the decision is also likely to play a role in that more thought and care would be put into more consequential decisions. Similarly, whether the decision-maker is held accountable or not is expected to increase the care put into a decision. Indeed, Pollmann, Potters and Trautmann [19] found a self-other difference in an investment task–surrogate decisions were more risk-taking–that disappeared with an accountability manipulation.

From a psychological perspective, the risk-as-feelings hypothesis suggests that our risk preferences are the product of an emotional reaction to the anticipated risk rather than a purely cognitive evaluation of the risk [12]. In a surrogate context, where the decision-maker is not the recipient of the outcome, there is an empathy gap between the decision-maker and the outcome [20], which might lead the decision-maker to underestimate the extent to which emotions affect others. This gap also creates psychological distance [21] between the decision-maker and the outcome, which means that they are more likely to engage in abstract rather than concrete thought. Therefore, one might expect that emotional involvement should be reduced in surrogate decision-making. In light of this, a straightforward prediction is that people's own risk preferences will be *attenuated* when making a decision on behalf of someone else. We expect that surrogate risk preferences will be closer to risk-neutrality, which is consistent with research suggesting that surrogate decisions are more optimal than people's own decisions–less susceptible to delay discounting [18], loss aversion [22] and framing effects [13]. However, the role that emotions play in the decision process is likely to vary according to features of the decision. For instance, emotional involvement may be stronger if the recipient is a child or a sibling rather than a stranger, or in a medical situation where the recipient's life is at risk, it might be different than in financial situations; which is why examining how context affects surrogate decisions is important. Although the risk-as-feelings hypothesis supports the Tunney and Ziegler [3] model's prediction about the identity of the recipient, it is unlikely to fully account for the occurrence and direction of self-other differences in all contexts.

Social Values Theory [23] proposes that surrogate decisions are made according to social values and expected appropriate behaviour. This arises from findings suggesting that people's own choices take into account multiple factors whereas giving advice to others involves focusing on the most important factor of a decision [24]. Consequently, self-other differences will arise when there is a social value placed on taking or avoiding a risk. If taking a risk is socially valued, people will take more risk when making a decision for someone else than for themselves, and vice versa when risk-taking is not socially valued. It makes sense for surrogates to make choices according to social norms and values, particularly in cases where they are not familiar enough with the recipient to know what decision they would want to make. Social values add another layer of detail and complexity to the factors that influence self-other differences that is not necessarily accounted for by the Tunney and Ziegler [3] model. However, it is difficult to make predictions regarding the impact of social values on particular surrogate choices given that their existence and content is difficult to identify.

Taken together, the theories we have presented make numerous conjectures about the factors that influence surrogate decisions, thereby predicting that self-other differences present themselves differently under different circumstances. The benefit of conducting the present

meta-analysis is to test whether these conjectures are supported. Indeed, findings regarding self-other differences in decisions involving risk have not always been consistent, which reinforces the need for a meta-analysis which investigates how different factors affect self-other differences.

Findings on self-other differences in risky decision making

Self-other differences appear notably different between decision domains. In the interpersonal domain, decision-makers seem to be less risk averse when making hypothetical decisions for a friend than for themselves [23,25–27]. In the medical domain, physicians seem to be more risk averse when making hypothetical decisions for a patient as opposed to themselves, as do parents when making hypothetical decisions for their children [28–31]. However, in the financial domain, the literature is rather contradictory. There are findings suggesting that decision-makers are less risk averse for close and distant recipients [13,19,32–36], while others reporting that decision-makers are more risk averse for recipients [37,38], as well as findings reporting no self-other differences [39,40]. The aim of the meta-analysis will be two-fold: firstly, identifying whether self-other differences vary across domains and why that may be the case, and secondly, examining whether certain factors can explain the discrepancies in the financial domain.

Moderators of self-other differences

We will first conduct a main analysis and moderator analyses of all effect sizes. We do not expect there to be an overall main self-other difference given that previous findings show that self-other differences in the medical and interpersonal domains are in opposite directions (therefore cancelling each other out when looking at an overall self-other difference) and results in the financial domain are mixed. Given our prediction that self-other differences in risk-taking vary across domains, we will conduct individual analyses for each decision domain to assess whether the context and content of the decision affects surrogate decisions differently in each domain. In order to do so, we also need to pick out theoretical moderators which we expect will have an influence on self-other differences given the theories we outlined above. Finally, to tease apart inconsistencies in findings, we will also include methodological moderators which can give us an indication of whether conflicting results are a consequence of experimental designs.

Theoretical moderators

Domain. Given previous findings, we expect surrogates to take more risk for others than for themselves in the interpersonal domain, whereas we expect surrogates to take less risk for others in the medical domain. In the financial domain, we do not anticipate an overall self-other difference due to framing effects which we detail below. Furthermore, decisions in the medical and interpersonal domain can be more significant and life-changing than financial decisions that involve small amounts of money, which the literature overwhelmingly consists of. Social values and expectations may also be more prevalent in those domains. According to Tunney and Ziegler's [3] model, self-other differences are indeed expected to vary across domains given that the significance of the decision, the accountability held upon the decision-maker and the intention of the decision-maker may vary. Social Values Theory [23] also predicts that self-other differences will differ across domains given that risk-taking is valued differently in each domain. Finally, we know that individual risk preferences are not constant across domains [41], nor do people attend to probabilities in the same way [42] or perceive the ratio between gains and losses to be equivalent [41]. It is therefore likely that self-other differences also vary across domains.

Frame. We expect self-other differences to differ depending on whether decisions are made in a gain or a loss frame. People tend to be risk averse in a gain frame and risk seeking in a loss frame [43]. According to the risk-as-feelings hypothesis which expects risk preferences to be attenuated when making decisions for others, we would expect self-other differences to be in opposite directions in a gain and a loss frame. We therefore predict that people take more risk for others in a gain frame and less risk for others in a loss frame, as has been found in previous studies [13,44,45]. In cases where decisions are framed as a gain but include the possibility of a loss, we speculate that self-other differences will be dampened compared to the gain frame. Similarly, for decisions that are framed as a loss but include the possibility of a gain, we expect that self-other differences will be dampened compared to the loss frame.

Recipient. Following from Tunney and Ziegler's model [3], the impact of psychological distance [21] and empathy gaps [20], we expect the identity of the recipient of the surrogate decision to influence the decision process, thereby having an effect on self-other differences. Given past research mentioned above concerning the effect of psychological distance on surrogate decision-making, we predict self-other differences to be more pronounced when the recipient is a stranger than when the recipient is a close other (i.e. where a relationship has developed between the decision-maker and the recipient: friend, relative, long-term patient. . .). We speculate that self-other differences may disappear when decisions are made for a group because people might feel more accountable as the decision affects more people.

Accountability. We expect the level of accountability held against the decision-maker to have an effect on surrogate decisions, thereby making them more cautious and potentially reducing the risk that surrogates are willing to take. Indeed, it has been found that doctors make more conservative decisions for their patients than themselves due to fear of the legal consequences [28]. However, due to the low number of available studies that manipulated accountability, we did not use accountability as a moderator. We will instead draw tentative conclusions about its effect through an analysis of previous studies in our discussion.

Methodological moderators

Decision outcome. In the financial domain, studies use either real decisions (performance-contingent payoffs) or hypothetical decisions (where the choices made in the experiment have no bearing on participant payment), which is why it is important to understand whether they are comparable. Data on whether the use of real or hypothetical rewards influences risk-taking is equivocal, with some studies reporting no difference [46,47], others reporting reduced risk-taking [48] or increased risk-taking [49] with real rewards. However, this has not been studied with respect to surrogate decision-making and the question remains open. Real decisions are likely to elicit stronger emotional involvement in the decision process than hypothetical decisions, or at least should better reflect a genuinely experienced emotion. Given that we assume self-other differences in risk preferences to be partly due to reduced emotional involvement when making a surrogate decision, we expect self-other differences to be larger when the outcomes are real rather than hypothetical. In terms of psychological distance, we know that there is greater distance between 'near and far' than 'far and further' [50]. If we consider hypothetical and surrogate decisions to be psychological distant decisions, surrogate decisions should be construed as more distant in real decisions than hypothetical decisions. We would therefore expect to find greater self-other differences in real than hypothetical decisions.

Design. We added the design used to measure self-other differences–whether the effect of recipient was elicited between-subjects or within-subjects–to investigate whether it moderates the strength of self-other differences. Within-subject designs might encourage participants to

compare their decisions between recipients which could lead to experimenter demand effects whereby participants become aware of the experimental manipulation and change their behaviour, which could result in larger self-other differences (see [51] for a comparison of between- and within-subject designs in behavioural economics). On the other hand, within-subject designs could also lead to carry-over effects, in such a way that decisions in one condition could contaminate the other and therefore lead to a uniformisation of responses across conditions [52]. As mentioned by Charness *et al.* [51], carry-over effects do not tend to produce specific behavioural responses but are rather a function of the circumstances, whereas experimenter demand effects have a tendency to magnify differences between conditions. Given that demand effects make clearer predictions than carry-over effects, we expect within-subject designs to lead to stronger self-other differences than between-subject designs.

Publication status. We hypothesise that published studies will show larger self-other differences than unpublished studies as published studies are generally biased towards statistically significant results and present larger effect sizes as has been found in reviews comparing results from published and unpublished studies within meta-analyses [53,54].

Method

Search strategies

Various electronic databases were searched (Web of Science, PsycINFO, PubMed, Scopus, EconPapers, Science Direct, Social Science Research Network, Google Scholar, Google) to identify studies in March 2017 (we have also added relevant studies that have been published since). We used the following search terms: 'risk', 'loss aversion' or 'uncertainty'; 'self and other', 'self-other', 'other', 'surrogate', 'social distance', or 'psychological distance'; 'choice', 'decision' or 'preference'. Studies that were cited by those that had been identified and studies that cited them were searched (backward and forward searching). Included studies compared choices (not ratings or advice) that an individual participant made for themselves to choices they made on behalf of another person or a group. Both published and unpublished studies (working papers, dissertations, doctoral theses, conference proceedings, unpublished data) were included. Unpublished studies were identified through the same search methods as published studies and we included some of our own unpublished data. Articles that were not written in English, French or Spanish were excluded.

After screening records by title, abstracts of potentially relevant articles were examined (N = 145). Duplicates were removed (N = 59). The full text of the remaining articles was assessed for eligibility according to our criteria (N = 86) and articles that did not meet them were eliminated (N = 43). We ended up with 43 articles consisting of 49 studies, to which we added 6 unpublished studies (N = 55). We contacted authors of articles which did not include sufficient information to compute effect sizes and excluded 8 studies from 6 articles from authors who did not provide us with this information. We therefore included 49 studies with a total of 7576 participants and 72 effect sizes (see S1 for a list of studies and S1 for details of studies). Fig 1 contains details concerning the numbers of records identified through each screening phase, adapted from the PRISMA statement [55].

Coding procedures

The first and third author read the papers independently and coded each study according to the coding frame developed by the first author. The percent agreement between both authors was high (89%). Disagreements were resolved through discussions between the first and third author. See S3 for details regarding the coding criteria used. Numbers associated to k refer to effect sizes.

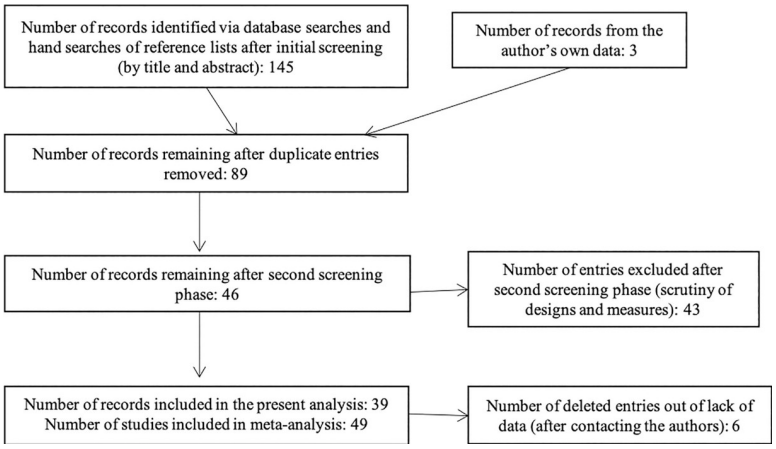

Fig 1. Flow of information through the different phases of the meta-analysis screening process, adapted from [55].

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Decision domain. We coded the domain in which participants were asked to make decisions: *Financial* domain ($k = 54$), *Interpersonal* domain ($k = 9$) or *Medical* domain ($k = 15$). We excluded studies in the interpersonal or medical domain that converted the outcomes of the choices that participants made to a monetary value which participants received as payment, as we believe this might have incentivised participants to think about their decisions as financial rather than medical/interpersonal, which makes the decision domain ambiguous.

Frame. Studies were coded according to whether decisions were made in a gain frame (k = 30), in a loss frame (k = 12), in a gain frame which included the possibility of a loss (k = 29) or in a loss frame which included the possibility of a gain (k = 7). In the financial domain, choices in a gain frame involved winning money, choices in a loss frame involved losing money, and choices which could either result in a loss or a win (investment tasks for example) were considered made in a gain frame with the possibility of a loss. In the medical domain, choices that involved taking a treatment to recover from an illness were coded as a loss with the possibility of a gain, as a gain could arise if the treatment works. Choices that involved a health improvement or vaccinations were coded as a gain or as a gain with the possibility of a loss, depending on whether doing so could worsen one's health. In the interpersonal domain, choices which involved starting new relationships or moving relationships forward were coded as a gain with the possibility of a loss given the possible negative consequences of making such decisions (no studies included situations which could be coded as a loss).

Recipient. We coded whether the recipient of the surrogate decision was either a stranger or unidentified other (k = 39), a known/close other (friend, family member. . .) (k = 34), or a group of people (2 or more) (k = 5).

Decision outcome. We coded whether the outcome of the decision was hypothetical (k = 41) or real (k = 37). Real outcomes were studies where the recipient of the decision was affected by the decisions made (both the decision makers when making choices for themselves and the recipient when decision makers made surrogate choices). Studies which involved real outcomes when participants made decisions for themselves but hypothetical rewards when they made decisions for others were excluded.

Design. Studies were coded according to whether self-other differences were elicited using a between-subjects design (k = 34) or a within-subjects design (k = 44). In a between-subjects design, one group of participants made decisions for themselves, which was compared

to another group of participants which made surrogate decisions. In a within-subjects design, the same group of participants made decisions for themselves as well as surrogate decisions.

Publication status. Studies were coded according to whether they were published studies (k = 51) or unpublished studies (k = 27).

Computation of effect sizes

We used standardized mean differences (Cohen's *d*) as the effect size metric. In a number of studies, effect sizes were estimated based on several assumptions. In cases where the total number of participants was given but not the exact number per group, we divided the total number by the number of groups to estimate the sample size. In cases where participants took part in two similar conditions (two different medical scenarios for example), we computed the effect size of both conditions together. When means and standard deviations were available, for between-subjects designs we used Cohen's d_s and for within-subjects designs we used Cohen's d_{av} [56]. For studies that only reported *t* values, for between-subjects designs we used Cohen's d_s from *t* [57], and for within-subjects designs we used Cohen's d_z [57]. For studies that only reported *F* values, we used Cohen's d_s from *F* [58]. For studies that only reported η^2, we transformed η^2 to *d* [59]. For studies that reported the proportion of participants making a particular choice, we calculated the odds ratio which we converted to Cohen's *d* [60]. We changed the sign of effect sizes where appropriate so that positive effect sizes represented choices for others that are more risk-taking than choices for the self and vice versa. We then transformed all effect sizes to Hedge's *g* which corrects for biases in small samples and is recommended for use in meta-analyses [56].

Analysis procedures

All analyses were performed in R using the *metaphor* package [61]. We used the random-effect model to compute the overall effect size of self-other differences rather than a fixed-effect model as the design and measures of included studies varied significantly. I^2 and *Q* were used as measures of heterogeneity. We report the 95% confidence intervals of each effect size. The issue of publication bias was addressed via examining the funnel plot in which all effect sizes are plotted against the standard error. To evaluate the severity of potential publication bias we examined the effect size estimates following Duval and Tweedie's [62] Trim-and-Fill method and Egger's regression intercept [63]. We used mixed-effect models for the moderator analyses. To include a particular moderator or a sub-category of a moderator in an analysis, there had to be at least 3 effect sizes from independent studies in that category. Given that we expect to find self-other differences in different directions according to the decision domain, we conducted separate main and moderator analyses on each domain as well as an overall analysis. For studies that included multiple effect sizes that were not independent (different conditions in a within-subjects design for example), they only contributed one summary effect size for the main analysis. Summary effect sizes for these studies were computed using Cooper's 'shifting-unit-of-analysis' method [64]. We did not use this method in moderator analyses as studies included multiple effect sizes because these related to different moderators; it did not make sense to compute a summary effect size in such cases.

Results

Analysis of all studies

Across all the studies there were no self-other differences in risk-taking ($k = 49$, $g = 0.009$, CI (-0.092, 0.109), $p = .864$). The analysis revealed that effect sizes were roughly symmetrical

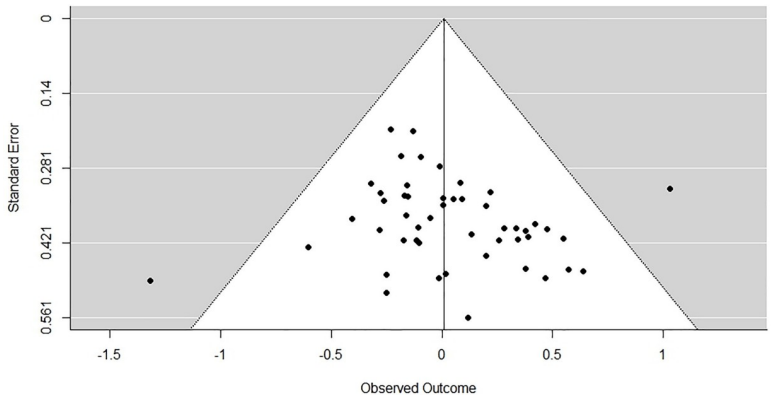

Fig 2. Funnel plot showing the effect sizes of all studies against their standard error. Effect sizes higher than 0 indicate that participants took more risk for someone else than for themselves. Effect sizes lower than 0 indicate that participants took less risk for someone else than for themselves.

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(Tau-squared = 0) and an absence of heterogeneity (I^2 = 0, Q = 42.281, p = .705). We assessed the extent of publication bias by firstly examining the adjusted effect size estimates according to the Trim-and-Fill procedure with a random effects model. No studies were found missing above the average effect size estimate, but ten studies were found missing below the average effect size. When ten studies with an imputed effect size lower than the mean effect estimate were filled in, the effect size estimate was in the other direction (k = 59, g = -0.089, CI (-0.194, 0.158), p = .096). However, Egger's regression test for funnel plot asymmetry revealed a non-significant regression coefficient (intercept = -0.13, SE = 0.12, p = .258). Taken together, both indicators suggest that publication bias has probably not affected the present analysis. See Fig 2 for the funnel plot.

Moderator analyses. The analysis revealed that the decision domain significantly moderated self-other differences in risk-taking (Q = 26.732, $p < .001$). There were no self-other differences in the financial domain (k = 54, g = 0.010, I (-0.099, 0.120), p = .852). However, there were significant differences in the interpersonal domain (k = 9, g = 0.554, CI (0.285, 0.823), $p < .001$) and in the medical domain (k = 15, g = -0.267, CI (-0.430, -0.105), p = .001), meaning that surrogate decisions were more risk-taking in the relationship domain but less risk-taking in the medical domain. The frame of the decision was also a significant moderator (Q = 13.531, p = .009). There were no self-other differences in the gain frame (k = 30, g = 0.063, CI (-0.078, 0.204), p = .379) and no self-other differences in the gain frame which included the possibility of a loss (k = 29, g = 0.101, CI (-0.040, 0.242), p = .159). There were differences in the loss frame (k = 12, g = -0.264, CI (-0.507, -0.022), p = .033) and in the loss frame which included the possibility of a loss (k = 7, g = -0.300, CI (-0.535, -0.064), p = .013) where decisions were less risk-taking for others than for the self. The remaining variables (recipient, outcome, design, publication status) were not significant moderators. A statistical breakdown of these results can be found in S4.

Meta-regression. We conducted a meta-regression with all the above moderators (domain, frame, recipient, outcome, design, publication) which was significant (k = 78, Q = 36.199, $p < .001$). Full results can be found in Table 1. The difference between the interpersonal and the financial domain was significant (B = 0.525, p = .014). The difference between the medical and the financial domain was marginally significant (B = -0.355, p = .057). The difference between the gain and loss frame was significant (B = -0.441, p = .004).

Table 1. Meta-regression on analysis of all studies*.

	B	SE	95% CI	P
Intercept	0.213	0.131	-0.044, 0.470	.105
Relationship (1) vs Financial (0)	0.525	0.214	0.106, 0.944	**.014**
Medical (1) vs Financial (0)	-0.355	0.186	-0.720, 0.010	.057
Loss (1) vs Gain (0)	-0.441	0.154	-0.743, -0.139	**.004**
Gain with Loss (1) vs Gain (0)	-0.161	0.118	-0.392, 0.071	.174
Loss with Gain (1) vs Gain (0)	-0.132	0.179	-0.482, 0.218	.459
Close (1) vs Stranger (0)	-0.064	0.116	-0.291, 0.162	.578
Group (1) vs Stranger (0)	-0.151	0.200	-0.543, 0.241	.450
Hypothetical (1) vs Real (0)	0.037	0.146	-0.250, 0.325	.798
Within (1) vs Between (0)	-0.031	0.100	-0.226, 0.165	.759
Unpublished (1) vs Published (0)	-0.030	0.107	-0.240, 0.180	.782

*Note: model is significant ($p < .001$)

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Interpersonal domain

Across all studies in the interpersonal domain there were significant self-other differences in risk-taking ($k = 8$, $g = 0.571$, CI (0.296, 0.847), $p < .001$), indicating that people take more risk for another person than for themselves. The analysis revealed that there was an absence of variation in the distribution of effect sizes (Tau-squared = 0) as well as an absence of heterogeneity ($I^2 = 0$, $Q = 3.838$, $p = .798$). We assessed the extent of publication bias by firstly examining the adjusted effect size estimates according to the Trim-and-Fill procedure with a random effects model. No studies were found missing below the average effect size estimate but two studies were deemed missing above the average effect size estimate. When two studies with an imputed effect size greater than the mean effect estimate were filled in, the effect size estimate was slightly higher ($k = 10$, $g = 0.657$, CI (0.409, 0.906), $p < .001$). This suggests that the analysis may be biased towards understating the summary effect size. This was confirmed by using Egger's regression test for funnel plot asymmetry which revealed a significant regression coefficient (intercept = 1.46, SE = 0.37, $p = .008$). Both indicators suggest that publication bias has affected the analysis by weakening the effect. We were unable to conduct moderator analyses on decisions from the interpersonal domain due to a low number of effect sizes.

Medical domain

Across all studies in the medical domain there were significant self-other differences in risk-taking ($k = 11$, $g = -0.297$, CI (-0.481, -0.112), $p = .002$), indicating that people take less risk for others than for themselves. The analysis revealed that there was an absence of variation in the distribution of effect sizes (Tau-squared = 0) as well as an absence of heterogeneity ($I^2 = 0$, $Q = 7.231$, $p = .703$). We assessed the extent of publication bias by firstly examining the adjusted effect size estimates according to Duval and Tweedie's (2000) Trim-and-Fill procedure with a random effects model. No studies were found missing below the average effect size estimate, but four studies were found missing above the average effect size estimate. When four studies with an imputed effect size higher than the mean effect estimate were filled in, the effect size estimate was slightly lower ($k = 15$, $g = -0.194$, CI (-0.363, -0.026), $p = .026$). However, Egger's regression test for funnel plot asymmetry did not reveal a significant regression coefficient (intercept = -0.02, SE = 0.12, $p = .897$). Therefore, we can conclude that the present analysis is probably not contaminated by publication bias.

We found that the frame of the decision was a significant moderator (Q = 8.391, p = .015). Self-other differences in a gain frame were not significant (k = 6, g = -0.203, CI (-0.474, 0.068), p = .141), but they were in a loss frame with the possibility of a gain (k = 7, g = -0.300, CI (-0.535, -0.064), p = .013) where risk-taking was higher for self than other. There were no decisions made in a loss frame and not enough made in a gain frame with the possibility of a loss to include it in the analysis. The recipient of the surrogate decision was a significant moderator (Q = 10.470, p = .005). Self-other differences when decisions were made on behalf of a stranger were not significant (k = 4, g = -0.319, CI (-0.776, 0.138), p = .171), but they were significant when decisions were made on behalf of a close other (k = 11, g = -0.260, CI (-0.434, -0.086), p = .003). There were self-other differences when decisions were made on behalf of a close other meaning that decisions were less risk-seeking for a close other than for a stranger (there were no studies where decisions were made on behalf of a group). Finally, the design was a significant moderator (Q = 10.657, p = .005), whereby self-other differences were larger in a within-subjects design (k = 10, g = -0.310, CI (-0.543, -0.076), p = .009) than a between-subjects design (k = 5, g = -0.228, CI (-0.454, -0.001), p = .049). We could not perform moderator analyses on outcome and publication status due to a low number of effect sizes. Given this, we did not perform a meta-regression either.

Financial domain

Across all studies in the financial domain there were no significant self-other differences in risk-taking (k = 31, g = 0.036, CI (-0.095, 0.167), p = .594). The analysis revealed that there was an absence of variation in the distribution of effect sizes (Tau-squared = 0) as well as an absence of heterogeneity (I^2 = 0, Q = 11.433, p = .999). We assessed the extent of publication bias by firstly examining the adjusted effect size estimates according to the Trim-and-Fill procedure with a random effects model. No studies were found missing above the average effect size, but four studies were found missing below. When four studies with an imputed effect size greater than the mean effect estimate were filled in, the effect size estimate was slightly lower (k = 35, g = -0.011, CI (-0.136, 0.115), p = .866). However, Egger's regression test for funnel plot asymmetry did not reveal a significant regression coefficient (intercept = -0.20, SE = 0.11, p = .088). Therefore, we can conclude that the present analysis was probably not contaminated by publication bias.

The frame of the decision was a significant moderator (Q = 8.323, p = .040). Self-other differences in the gain frame were marginally significant (k = 24, g = 0.163, CI (-0.003, 0.328), p = .054) where people took slightly more risk for others than for themselves. There were self-other differences in the loss frame (k = 12, g = -0.264, CI (-0.507, -0.022), p = .033) where people took less risk for others than for themselves. However, there were no self-other differences in the gain frame when the choice included the possibility of a loss (k = 18, g = -0.020, CI (-0.202, 0.162), p = .831). The remaining variables (recipient, outcome, design, publication status) were not significant moderators. A statistical breakdown can be found in S4.

Finally, we conducted a meta-regression with all the above moderators (domain, frame, recipient, outcome, design, publication status) which approached significance (k = 54, Q = 10.179, p = .179). Results can be found in Table 2, in which it can be seen that, even though the model is not significant, there is a difference between decisions made in a gain frame as opposed to those made in a loss frame (B = -0.452, p = .004).

Discussion

We did not find an overall self-other difference. However, we show that distinct patterns of self-other differences emerge when we consider a series of theoretical moderators. Crucially,

Table 2. Meta-regression on analysis of financial domain*.

	B	SE	95% CI	p
Intercept	0.276	0.137	-0.035, 0.503	.089
Loss (1) vs Gain (0)	-0.452	0.157	-0.760, -0.144	**.004**
Gain with Loss (1) vs Gain (0)	-0.176	0.133	-0.437, 0.086	.188
Close (1) vs Stranger (0)	-0.152	0.136	-0.419, 0.115	.264
Group (1) vs Stranger (0)	-0.165	0.201	-0.559, 0.228	.410
Hypothetical (1) vs Real (0)	0.075	0.150	-0.219, 0.369	.618
Within (1) vs Between (0)	-0.012	0.122	-0.250, 0.236	.920
Unpublished (1) vs Published (0)	-0.047	0.117	-0.276, 0.183	.689

*Note: model is not significant (p = .179)

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we found that there are differences between decision domains and decision frames, even when other moderators are accounted for. This suggests that self-other differences are not easily comparable and sheds light on the inconsistencies in findings that have arisen so far. In the sections below, we discuss these moderator effects.

Domain

Self-other decisions were moderated by decision domain (medical, financial or interpersonal). In the medical domain, decision-makers are more risk-taking for themselves than for another person (small effect), whereas in the interpersonal domain they are more risk-taking for someone else than for themselves (medium effect). In the financial domain, there seems to be an overall absence of self-other differences. This finding is concurrent with the previous meta-analysis [15] which showed that decisions were more risk-averse for others in a medical context but that there were no self-other differences in other contexts (financial and interpersonal decisions were analysed together). This is crucial to our understanding of surrogate decision-making as it shows that decisions are not necessarily comparable across domains, meaning that there are features of each domain which require further investigation to understand why divergent patterns of self-other differences arise.

A key difference between the interpersonal and medical domains and the financial domain is the significance of the decision, which could explain the difference in effect size between domains. Although financial decisions can be just as important and consequential as interpersonal or medical decisions, the amounts of money that are used in all included studies but one (study 3 in [9] are small (two or three digit amounts). In fact, studies that use real rewards (about two thirds of financial studies) convert outcomes of choices to payments (which tend to be a single digit amount), meaning that participants are actually making decisions that involve very small amounts of money. All financial studies used relatively inconsequential decisions, whereas interpersonal studies could include life-changing decisions and medical studies often did. The present meta-analysis can draw conclusions only about financial decisions which have a small outcome. It may be that self-other differences are altered when large outcomes are studied. On the other hand, a significant proportion of studies in the financial domain used real decisions, thereby increasing their ecological validity. In the medical and interpersonal domain, where decisions were hypothetical, it could be that participants were motivated by self-image concerns, conforming to social norms in an experimental setting, but might not do so in real scenarios. However, we did not find any differences between real and hypothetical outcomes in financial decisions.

Following from Social Values Theory [23], it could be the case that risk-aversion is valued in the medical domain whereas risk-taking is valued in the interpersonal domain. It is plausible to assume that taking a medical decision that could lead to a negative outcome, or the absence of an outcome, would be seen as a bad decision. A high degree of responsibility and accountability could be then held against the decision-maker, particularly in public health scenarios or decisions that could lead to the death of a patient. In terms of relationships however, taking a certain level of risk is perhaps necessary to developing a relationship. It remains unclear which social values could prevail in financial decisions, particularly those with little consequences. Nonetheless, taking high risks could be considered impulsive and irrational, and therefore not socially valued, especially when it comes to decisions which involve large amounts of money. However, in the case of the financial decisions made leading up to the financial crisis, decision-makers were in fact accused of excessive risk-taking [8], which makes the study of surrogate financial decisions with large outcomes all the more relevant and necessary.

Frame

We also found that the frame of the decision was a significant moderator, but did not necessarily manifest itself in the same way across domains. Overall, people were less risk-taking for someone else than for themselves in a loss frame and in a loss frame which includes the possibility of a gain. There were no differences when decisions were in a gain frame or in a gain frame which included the possibility of a loss. This is consistent with the previous meta-analysis [15] which found self-other differences for losses but not gains. Given that we know that people are more impacted by losses than gains [43], it is plausible that this effect would also translate to a surrogate context, where accountability might be higher for losses than gains. In the financial domain, self-other differences were divergent depending on the frame in which they were elicited and followed the predictions we made given the risk-as-feelings hypothesis (i.e. risk preferences were attenuated in a surrogate context). This helps to elucidate contradictory findings in the financial domain. In the medical domain, although risk-taking was reduced for others, self-other differences were significant in a loss frame but not in a gain frame. We were unable to investigate the effect of frame in the interpersonal domain due to a lack of studies made in a loss frame. In fact, all studies from the interpersonal domain used or adapted the scenarios devised by Beisswanger *et al.* [25], which could be why the most consistent and strongest self-other difference is found within this domain. There is therefore a need for studies using different scenarios to study the interpersonal domain.

Recipient

We did not find that the identity of the recipient of the surrogate decision moderated the overall effect, although this could be because there was no overall self-other difference. In the medical domain, the recipient was a significant moderator of the self-other difference: people take less risk when decisions were made on behalf of a close other than on behalf of a stranger. This could be because they are more concerned about taking a risk which leads to a negative outcome when the recipient is someone close to them as opposed to someone they do not know. It could also be that accountability has a larger effect on decisions for a close other than for a stranger, if decisions made for a stranger give more anonymity to the decision-maker for example. In the interpersonal domain, we were unable to look at the effect of recipient. In the financial domain, although the identity of the surrogate recipient was not a significant moderator, the effect sizes indicate a trend whereby decisions made on behalf of a stranger may be more risk-taking than one's own decisions, whereas decisions made for a close other or a group of people may be less risk-taking. We therefore find some evidence for an effect of

psychological distance, but evidence is weak and further research is needed. Interestingly, a study found that surrogates believe they would reduce their financial risk-taking for others relative to themselves [65], which is in line with the behavioural trend we find here for close others but not distant others. This indicates that there might be a discrepancy between what surrogates believe they would do and what they actually do. There is also evidence from the wider literature that psychological distance has an effect on surrogate decisions. For example, smaller psychological distance increases surrogates' emotional burden, making them more likely to minimise the risk of regret when making decisions [66].

Accountability

We could not quantitatively assess the effect of accountability given the low number of studies that we were able to include. The results of these studies are nonetheless interesting. Eriksen and Kvaloy [37] found that people take less risk for someone else than for themselves in an investment task where the recipient was given feedback on choices made by the decision-maker. Pollmann *et al.* [19] found that people take less risk for others when accountability is manipulated in an investment task than when it is not. Losecaat Vermeer [67] found that in a gain frame, people took more risk for someone else but more so in a low than a high responsibility condition. Moreover, in terms of decision made on behalf of a group of people, whereby the decision is affecting more people and therefore has larger consequences, we hypothesise that this would increase the effect of accountability and social values on the decision process and perhaps also reduce risk-taking, which is in line with the trend evidence reported here. This is in line with the previous meta-analysis which suggests that surrogate decisions might be drawn to risk-aversion due to the avoidance of anticipated blame [15]. More studies are needed to investigate the effect of accountability on risk-taking in the financial literature, and it would be particularly interesting to assess its impact on decisions with large outcomes–perhaps holding decision makers accountable for their decisions can reduce irresponsible or high risk-taking. For similar reasons, assessing its impact on other decision domains would be beneficial, such as studying the consequences that the fear of being held accountable or legally pursued can have on doctors' decision-making.

Methodological moderators

We did not find that the nature of the outcome impacted self-other differences. This is particularly relevant to the financial domain where there is an ongoing debate about the validity of experiments that do not use performance-contingent payments [68]. Although risk-taking might differ between real and hypothetical rewards, this does not seem to affect the conclusions that can be drawn about self-other differences. However, we were not able to include real medical or interpersonal decisions. We did not find differences overall between studies that used a between-subject design to test self-other differences and those that used a within-subjects design. On the other hand, self-other differences in the medical domain were stronger in within-subject designs than in between-subject designs, which indicates some evidence for experimenter demand effects. We did not find differences either between published and unpublished studies, which is reassuring with respect to potential publication bias. However, this could be partly attributable to the fact that a lot of studies were working papers from the economics literature which are of a similar standard to published papers.

Future directions

The present meta-analysis has identified several gaps in the literature. For a start, there are considerably more studies that have investigated financial decisions than interpersonal and

medical decisions. We could also not perform several of our moderator analyses due to a low number of effect sizes. Further work is needed to identify how the identity of the surrogate recipient affects decisions in both the interpersonal and the financial domains. To be able to adequately compare self-other differences across domains, decisions in the financial domain that have higher levels of significance require investigation. One of the setbacks to studying larger outcomes is that using real payoffs that match amounts used in the experimental task is unlikely to be possible. However, we did not find a difference here between studies using real and hypothetical outcomes, indicating that perhaps using hypothetical outcomes may be an adequate proxy for real decisions. Nevertheless, real-world decisions are often a lot more complex than the scenarios set up in these studies, which is why it is so important to study how a variety of features of a decision impact surrogate risk-taking. There is indeed a need for looking at surrogate decisions in real world settings, particularly for medical and interpersonal domains where experimental studies have so far been restricted to hypothetical scenarios. Investigating the role of accountability and social values will be a particularly important step to understanding real-world decision-making.

Finally, in this review, we have been quite liberal about our definition of risk and the studies we incorporated as a result in our meta-analysis. We chose to keep the definition broad in order to bring together different literatures and theories on risk-taking in surrogate decision-making. These can be quite distinct in the scenarios they present. For example, experiments in the economic literature uses probabilistic outcomes whereas those in the interpersonal did not and conceptualised risk as the uncertainty contained in the actions of others. For that reason, we analysed these literatures together in our overall analysis, but also separately by decision domain. Nevertheless, the differences between the scenarios in each domain leads one to wonder whether they are measuring the same thing when it comes to risk. Future work should aim to create scenarios which are more easily comparable across domains, controlling for factors such as the presence or absence of clear probabilistic outcomes. There is indeed evidence of a distinction between our attitudes towards a purely probabilistic risk (where risk is not contingent on others' behaviour) and a social risk (where risk is contingent on others' behaviour) [69], which is reflected in the finding that individual risk attitudes vary between domains [41]. Future work should aim to tease apart both types of risk in the context of surrogate decisions in order to better understand the domain differences we highlight here.

Conclusion

Our meta-analysis indicates that the differences between risky decisions that people make for themselves and those they make for others vary according to the domain and the frame of the decision. We believe that the present meta-analysis has contributed to the debate in the literature and offered potential avenues of research to be pursued to enhance our understanding of risk preferences in surrogate decision making.

Supporting information

S1 Appendix. List of studies.
(DOCX)

S2 Appendix. Characteristics and effect sizes of all studies.
(DOCX)

S3 Appendix. Coding frame for methodological and theoretical moderators.
(DOCX)

S4 Appendix. Statistical differences between self and other decisions.
(DOCX)

S5 Appendix. PRISMA checklist.
(DOC)

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Supplementary File 1: List of papers included in meta-analysis

1. Andersson, O., Holm, H. J., Tyran, J.-R., & Wengström, E. (2013). Risking Other People's Money: Experimental Evidence on Bonus Schemes, Competition, and Altruism. IFN Working Paper, (989), 1–49.

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Supplementary File 2: Characteristics and effect sizes of all studies

Author	Year	Study	Domain	Frame	Recipient	Design	Outcome	Publication	N (total)	g	Variance
Andersson et al	2013	1	Financial	Gain	Group	Between	Real	Unpublished	437	0.082	0.095
Andersson et al	2014	1	Financial	Gain	Stranger	Between	Real	Published	168.5	-0.007	0.153
Andersson et al	2014	1	Financial	Gain with Loss	Stranger	Between	Real	Published	168.5	0.190	0.153
Batteux et al	2017a	1	Financial	Gain	Stranger	Within	Real	Published	99	0.077	0.141
Batteux et al	2017a	1	Financial	Gain	Close	Within	Real	Published	99	0.365	0.142
Batteux et al	2017b	1	Financial	Gain with Loss	Stranger	Within	Real	Unpublished	35	0.469	0.237
Batteux et al	2017b	2	Financial	Gain with Loss	Stranger	Within	Real	Unpublished	79	0.378	0.159
Batteux et al	2017b	3	Medical	Gain	Stranger	Within	Hypothetical	Unpublished	36	-0.021	0.231
Batteux et al	2017b	3	Medical	Loss with Gain	Stranger	Within	Hypothetical	Unpublished	36	-0.328	0.232
Batteux et al	2017b	4	Financial	Gain	Stranger	Within	Real	Unpublished	46	0.481	0.208
Batteux et al	2017b	4	Financial	Loss	Stranger	Within	Real	Unpublished	46	0.081	0.205
Batteux et al	2019	2	Financial	Gain with Loss	Stranger	Within	Real	Published	36	0.017	0.231
Batteux et al	2019	2	Medical	Loss with Gain	Stranger	Within	Hypothetical	Published	36	-0.252	0.232
Beisswanger et al	2003	1	Interpersonal	Gain with Loss	Close	Between	Hypothetical	Published	134	0.344	0.172
Beisswanger et al	2003	2	Interpersonal	Gain with Loss	Close	Between	Hypothetical	Published	182	0.422	0.149
Beisswanger et al	2003	3	Interpersonal	Gain with Loss	Close	Between	Hypothetical	Published	81	0.572	0.223
Benjamin & Robbins	2007	1	Financial	Gain	Close	Within	Hypothetical	Published	36	0.138	0.231

Author	Year	Study	Domain	Frame	Recipient	Design	Outcome	Publication	N (total)	g	Variance
Benjamin & Robbins	2007	1	Financial	Loss	Close	Within	Hypothetical	Published	36	-0.371	0.233
Carroll et al	2017	1	Medical	Loss with Gain	Close	Between	Hypothetical	Published	701	-0.230	0.055
Carroll et al	2017	1	Medical	Loss with Gain	Close	Between	Hypothetical	Published	701	-0.033	0.064
Carstendsdottir	2015	1	Financial	Gain	Close	Between	Hypothetical	Unpublished	37	0.119	0.315
Colby	2010	2	Financial	Gain	Close	Between	Hypothetical	Unpublished	260.5	0.201	0.124
Dore et al	2014	1	Medical	Gain	Close	Within	Hypothetical	Published	100	-0.406	0.142
Dore et al	2014	2	Medical	Gain	Close	Within	Hypothetical	Published	216	-0.322	0.097
Eriksen & Kvaloy	2010	1	Financial	Gain with Loss	Stranger	Between	Real	Published	320	-0.155	0.111
Eriksen et al	2017	1	Financial	Gain	Stranger	Within	Real	Unpublished	190	-0.057	0.102
Eriksen et al	2017	1	Financial	Gain with Loss	Stranger	Within	Hypothetical	Unpublished	190	0.040	0.102
Fleming & Slank	2015	1	Interpersonal	Gain with Loss	Stranger	Between	Hypothetical	Published	165	0.337	0.155
Fullbrunn & Luhan	2015	1	Financial	Gain with Loss	Group	Within	Real	Unpublished	175	-0.279	0.107
Fullbrunn & Luhan	2015	2	Financial	Gain with Loss	Stranger	Within	Real	Unpublished	34	-0.015	0.237
Garcia-Retamero & Galesic	2012	1	Medical	Loss with Gain	Close	Within	Hypothetical	Published	40	-1.317	0.242
Haavik & Zeiler	2010	1	Financial	Gain	Stranger	Between	Real	Unpublished	80	0.636	0.225
Humphrey & Renner	2011	1	Financial	Gain	Stranger	Between	Real	Unpublished	87	-0.164	0.212
Humphrey & Renner	2011	1	Financial	Gain	Close	Between	Real	Unpublished	99	-0.050	0.198
Lu et al	2018	1	Financial	Gain	Close	Between	Hypothetical	Published	132	-0.252	0.175
Lu et al	2018	1	Financial	Loss	Close	Between	Hypothetical	Published	132	0.090	0.174
Lu et al	2018	2	Financial	Gain	Close	Between	Hypothetical	Published	119	-0.404	0.185

Author	Year	Study	Domain	Frame	Recipient	Design	Outcome	Publication	N (total)	g	Variance
Lu et al	2018	2	Financial	Loss	Close	Between	Hypothetical	Published	119	-0.106	0.183
Montinari & Rancan	2013	1	Financial	Gain with Loss	Stranger	Within	Real	Unpublished	254	-0.027	0.088
Montinari & Rancan	2013	1	Financial	Gain with Loss	Close	Within	Real	Unpublished	254	-0.342	0.089
Oliver	2013	1	Medical	Loss with Gain	Stranger	Within	Hypothetical	Published	60	-0.604	0.184
Palmer	2014	1	Interpersonal	Gain with Loss	Close	Between	Hypothetical	Unpublished	230	0.550	0.171
Petrova et al	2016	1	Medical	Gain	Close	Within	Hypothetical	Published	114	-0.262	0.118
Pollmann et	2014	1	Financial	Gain with Loss	Stranger	Between	Real	Published	222	0.256	0.173
Polman	2012	3	Financial	Gain with Loss	Stranger	Between	Real	Published	140	0.388	0.169
Reynolds et al	2009	1	Financial	Gain with Loss	Group	Within	Real	Published	85	-0.323	0.153
Reynolds et al	2009	2	Financial	Gain with Loss	Group	Within	Real	Published	42	0.000	0.214
Rigoli et al	2018	1	Financial	Gain	Stranger	Within	Real	Published	40	0.379	0.221
Stone & Allgaier	2008	3	Interpersonal	Gain with Loss	Close	Between	Hypothetical	Published	55	0.155	0.275
Stone & Allgaier	2008	3	Interpersonal	Gain with Loss	Stranger	Between	Hypothetical	Published	55	0.249	0.272
Stone et al	2013	1	Interpersonal	Gain with Loss	Close	Between	Hypothetical	Published	180	0.777	0.153
Stone et al	2013	1	Medical	Gain with Loss	Close	Between	Hypothetical	Published	180	-0.671	0.152
Sun et al	2016	1	Financial	Gain	Stranger	Between	Hypothetical	Published	95	1.074	0.216
Sun et al	2016	1	Financial	Loss	Stranger	Between	Hypothetical	Published	95	-0.122	0.202
Tang et al	2016	1	Medical	Gain	Close	Within	Hypothetical	Published	245	-0.150	0.090
Tang et al	2016	1	Medical	Gain	Close	Within	Hypothetical	Published	245	-0.043	0.090

Author	Year	Study	Domain	Frame	Recipient	Design	Outcome	Publication	N (total)	g	Variance
Teger & Kogan	1971	1	Financial	Gain with Loss	Stranger	Between	Real	Unpublished	50	-0.065	0.237
Teger & Kogan	1971	1	Financial	Gain with Loss	Close	Between	Real	Unpublished	50	-0.144	0.238
Tunney	2015	1	Financial	Gain	Stranger	Within	Hypothetical	Unpublished	59	0.204	0.182
Tunney	2015	1	Financial	Gain	Close	Within	Hypothetical	Unpublished	59	-0.117	0.182
Tunney	2015	1	Financial	Loss	Stranger	Within	Hypothetical	Unpublished	59	0.099	0.182
Tunney	2015	1	Financial	Loss	Close	Within	Hypothetical	Unpublished	59	-0.157	0.182
Tunney	2015	2	Financial	Gain	Stranger	Between	Hypothetical	Unpublished	90	0.050	0.207
Tunney	2015	2	Financial	Loss	Stranger	Between	Hypothetical	Unpublished	90	-0.611	0.212
Vlaev et al	2017	2	Financial	Gain	Stranger	Within	Real	Published	40	0.270	0.220
Vlaev et al	2017	2	Financial	Loss	Stranger	Within	Real	Published	40	0.000	0.219
Wray & Stone	2005	1	Interpersonal	Gain with Loss	Close	Within	Hypothetical	Published	214	1.031	0.103
Zaleska & Kogan	1971	1	Financial	Gain with Loss	Group	Within	Real	Published	54	-0.252	0.265
Zhang et al	2017	1	Financial	Gain	Stranger	Within	Real	Published	57	0.343	0.186
Zhang et al	2017	1	Financial	Loss	Stranger	Within	Real	Published	57	-0.447	0.187
Zhang et al	2017	2	Financial	Gain	Stranger	Within	Real	Published	82	0.383	0.156
Zhang et al	2017	2	Financial	Loss	Stranger	Within	Real	Published	82	-0.861	0.162
Zhang et al	2017	2	Financial	Gain	Close	Within	Real	Published	82	0.166	0.155
Zhang et al	2017	2	Financial	Loss	Close	Within	Real	Published	82	-0.323	0.156
Ziegler & Tunney	2015	1	Financial	Gain	Stranger	Within	Real	Published	73	0.208	0.164

Ziegler & Tunney	2015	1	Financial	Loss	Stranger	Within	Real	Published	73	-0.197	0.164
Zikmund-Fisher et al	2007	1	Medical	Gain with Loss	Stranger	Between	Hypothetical	Published	1183	-0.180	0.057
Zikmund-Fisher et al	2007	1	Medical	Gain with Loss	Close	Between	Hypothetical	Published	1215	-0.280	0.058

Supplementary File 3: Coding frame for methodological and theoretical moderators

Moderator	Code	Definition
Theoretical moderator: Domain	Financial (*k*=54)	Decisions where the recipient can win or lose money
	Interpersonal (*k*=9)	Decisions concerning romantic scenarios between two people: the recipient of the decision and a potential mate or partner
	Medical/Safety (*k*=15)	Decisions concerning the recipient's health or safety
Theoretical moderator: Frame	Gain (*k*=30)	Decisions which place the decision-maker in a gain frame relative to their current position (e.g. winning money or finding a partner)
	Loss (*k*=12)	Decisions which place the decision-maker in a loss frame relative to their current position (e.g. losing money or being ill)
	Gain with Loss (*k*=29)	Decisions which place the decision-maker in a gain frame relative to their current position but which can incur a loss (e.g. investment tasks where the final outcome will be a gain, but losses might be incurred during)
	Gain with Loss (*k*=7)	Decisions which place the decision-maker in a loss frame relative to their current position but which can result in a gain (e.g. taking a treatment to attempt to recover from an illness)

Theoretical moderator: Recipient	Stranger (*k*=39)	Recipient who the decision-maker is not familiar with or has not built a relationship with (unknown other, fellow participant, unidentified patient, patient with no evidence of a doctor-patient relationship)
	Close other (*k*=34)	Recipient who the decision-maker has a relationship with (friend, relative, long-term patient)
	Group (*k*=5)	Decision where there are several recipients (more than one person)
Methodological moderator: Outcome	Real (*k*=37)	Decisions which had a real outcome: the recipient received the outcome of the choice
	Hypothetical (*k*=41)	Decisions which had a hypothetical outcome: the recipient did not receive the outcome of the choice
Methodological moderator: Design	Between-subjects (*k*=34)	Studies where one group of participants made choices for themselves and another group of participants made choices for someone else – self-other differences were elicited between groups
	Within-subjects (*k*=44)	Studies where one group made choices for themselves and choices for someone else – self-other differences were elicited within one group
Methodological moderator: Publication status	Published (*k*=51)	Published journal article
	Unpublished (*k*=27)	Dissertations/thesis, working paper, conference proceeding, unpublished data

Supplementary File 4: Statistical differences between self and other decisions

	k	g	CI	Q	p
Main Effects					
All studies	49	0.009	[-0.092, 0.109]	42.281	.705
Financial	31	0.036	[-0.095, 0.167]	11.433	.533
Medical	11	-0.297	[-0.481, -0.112]	7.231	**.002**
Interpersonal	8	0.571	[0.296, 0.847]	3.838	**<.001**
Moderator: Domain				27.666	**<.001**
Financial	54	0.010	[-0.099, 0.120]		.852
Medical	15	-0.267	[-0.430, -0.105]		**.001**
Interpersonal	9	0.554	[0.285, 0.823]		**<.001**
Moderator: Frame				13.531	**.009**
Gain	20	0.063	[-0.078, 0.204]		.379
Loss	12	-0.264	[-0.507, -0.022]		**.033**
Gain with Loss	29	0.101	[-0.040, 0.241]		.159
Loss with Gain	7	-0.300	[-0.535, -0.064]		**.013**
Moderator: Recipient				1.096	.778
Stranger	39	0.038	[-0.092, 0.168]		.567
Close other	34	-0.047	[-0.168, 0.073]		.440
Group	5	-0.076	[-0.436, 0.283]		.677
Moderator: Outcome				0.401	.818
Real	37	0.016	[-0.113, 0.146]		.803
Hypothetical	41	-0.034	[-0.149, 0.081]		.560
Moderator: Design				0.927	.629
Between-subjects	34	0.032	[-0.095, 0.159]		.619
Within-subjects	44	-0.049	[-0.166, 0.068]		.410
Moderator: Publication status				0.222	.895
Published	51	-0.024	[-0.129, 0.082]		.657
Unpublished	27	0.012	[-0.136, 0.160]		.875

Medical Domain Analyses					
Moderator: Frame				8.391	**.015**
Gain	6	-0.203	[-0.474, 0.068]		.141
Loss with Gain	7	-0.300	[-0.535, -0.064]		**.013**
Moderator: Recipient				10.470	**.005**
Stranger	4	-0.319	[-0.776, 0.138]		.171
Close other	11	-0.260	[-0.434, -0.086]		**.003**
Moderator: Design				10.657	**.005**
Between-subjects	5	-0.228	[-0.454, -0.001]		**.049**
Within-subjects	10	-0.310	[-0.543, -0.076]		**.009**
Financial Domain Analyses					
Moderator: Frame				8.323	**.040**
Gain	24	0.163	[-0.003, 0.328]		.054
Loss	12	-0.264	[-0.507, -0.022]		**.033**
Gain with Loss	18	-0.020	[-0.202, 0.162]		.831
Moderator: Outcome				0.064	.969
Real	37	0.016	[-0.113, 0.146]		.803
Hypothetical	17	-0.005	[-0.207, 0.198]		.965
Moderator: Recipient				1.270	.736
Stranger	33	0.059	[-0.080, 0.198]		.404
Close other	16	-0.065	[-0.268, 0.137]		.527
Group	5	-0.076	[-0.436, 0.436]		.678
Moderator: Design				0.263	.877
Between-subjects	21	0.045	[-0.134, 0.224]		.623
Within-subjects	33	-0.010	[-0.148, 0.128]		.885
Moderator: Publication status				0.035	.983
Published	30	0.011	[-0.141, 0.164]		.884
Unpublished	24	0.009	[-0.148, 0.166]		.907

Paper 2

How frame and outcome magnitude affect financial and medical surrogate risk preferences

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How frame and outcome magnitude affect financial and medical surrogate risk preferences

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Abstract

Research findings show that we often make different decisions for others (surrogate decisions) than ourselves, but they have not been consistent across decision domains. This would follow from the diversity of contexts in which surrogate decisions take place. We suggest that these discrepancies are partly due to differences in decision frame and outcome magnitude across studies. To test this we experimentally investigated the effects of frame and outcome magnitude on self-other differences in risk-taking in financial and medical domains. For both financial gains and medical losses, any self-other differences with small outcomes were magnified with large outcomes. However, there were no self-other differences for financial losses or medical gains. For financial decisions involving small wins, we found self-other differences with real outcomes but not with hypothetical outcomes. These findings demonstrate the impact of the significance of the outcome on self-other differences, thereby reinforcing the need for studies that investigate surrogate decision-making in real-world contexts. Finally, the diverging effect of frame between decision domains reinforces their differences and calls for more work to understand why they arise.

Keywords: DMfO; surrogate decisions; risk preferences; framing; magnitud

Introduction

We are often required to make decisions on behalf of someone else, where the recipient of the decision bears the consequences of its outcome. These decisions, which we term surrogate decisions, can affect a wide range of people (spouse, children, patients, employees, voters, consumers, etc.) and are therefore worthy of study. An increasing number of findings suggest that surrogate risk preferences differ from people's own risk preferences. Indeed, the outcome of a surrogate decision affects us differently than our own decisions – it follows that our decision are altered. Moreover, the diversity of contexts in which they can take place makes it unlikely that self-other differences manifest themselves in a clear and consistent manner, which has been the case in the literature to date. In the present paper, we test theoretical predictions of self-other differences to help unpick some of these discrepancies. We do so by investigating how the frame and significance of the decision alter surrogate risk-taking in the financial and medical domains. Financial studies on the matter have so far focused on small outcomes, whereas medical studies have focused on rather large outcomes. However, there are many real-world instances of the contrary, such as large investments for financial agents or parents giving non-prescription medication to their children. There are therefore gaps in the literature that need to be filled in order to explain self-other differences across domains, which we propose to do here.

Theoretical predictions

A number of theoretical accounts of surrogate decision-making make predictions about how it is impacted by the significance of the decision. It has been conjectured that being responsible for somebody else's welfare pushes decision-makers to be more cautious than when deciding for themselves (Charness & Jackson, 2009). Responsibility is expected to

increase with the significance of the decision, which means that decision-makers should reduce their risk-taking for others relative to themselves as the significance increases. This hypothesis is supported by findings in the medical domain, which have overwhelmingly shown that we accept less risk for others than ourselves (Dore, Stone, & Buchanan, 2014; R Garcia-Retamero & Galesic, 2012; Tang, Shahab, Robb, & Gardner, 2016; Zikmund-Fisher, Sarr, Fagerlin, & Ubel, 2006). Scenarios in these studies have focused on highly significant decisions – treatment choices to prevent or recover from illnesses which often involved a risk of death. This is consistent with Tunney and Ziegler's (2015) model of surrogate decision-making, which assumes that surrogates engage in perspective-taking that varies according to the particular features of the decision. This model predicts that significant decisions would lead surrogates to take a benevolent perspective (i.e. what is best for the recipient). On the other hand, more trivial decisions might lead surrogates to put less effort into the decision and adopt a projected perspective (i.e. what they would do for themselves). Therefore, any self-other differences would be the result of other factors than the perspective taken by the surrogate, such as the decision-maker's reaction to the risk

Indeed, the risk-as-feelings hypothesis depicts risk preferences as the result of emotional reactions to the risk rather than a cognitive evaluation of the risk (Loewenstein, Weber, Hsee, & Welch, 2001). In the case of surrogate decisions there is an empathy gap between the decision-maker and the outcome (Loewenstein, 1996) and the decision-maker will be less emotionally involved in the decision. As a result, the emotional reactions to the risk would be attenuated, and consequently the risk preferences would be too. This self-other difference would be driven by an emotional process rather than a cognitive one as in the Tunney and Ziegler (2015) model. The majority of finding in support of the risk-as-feelings hypothesis are in the financial domain. Given framing effects on risk-taking (Tversky & Kahneman, 1981), where people tend to be risk-averse in a gain frame and risk-seeking in a loss frame, it can be

expected that they will also have an impact on self-other differences. There are reports of diverging self-other differences depending on the frame of the decision, where surrogate choices are less risk-averse than people's own choices in a gain frame and less risk-seeking in a loss frame (Sun, Liu, Zhang, & Lu, 2016; Zhang, Liu, Chen, Shang, & Liu, 2017; Ziegler & Tunney, 2015).

In light of this, we propose that surrogate decisions tend toward risk neutrality for others, but that under circumstances where a substantial amount of responsibility is placed on the decision-maker, a cautious shift can be observed. This cautious shift is expected to counteract the tendency towards risk neutrality and lead to a reduction in surrogate risk-taking. In a loss frame, where decision-makers are expected to take less risk for others for small outcomes, self-other differences would be accentuated for more significant decisions. In a gain frame, where decision-makers are expected to take more risk for others for small outcomes, this should mean that self-other differences would either be reduced, disappear, or reverse. There has been evidence of this with decisions about current or prospective relationships, which can be considered as gains with a potential loss. For low impact scenarios, decision-makers accept more risk for others than themselves, but there are no self-other differences for high impact scenarios (Beisswanger, Stone, Hupp, & Allgaier, 2003; Stone & Allgaier, 2008). In these studies, it seems to be the case that the level of risk participants took for themselves was not affected by the impact of the scenario, but that risk-taking was reduced for others in high impact scenarios.

Findings in the relationship domain have been interpreted by a social values account which suggests that self-other differences will occur if there is a social value placed on risk-taking, which is more likely to impact surrogate decisions than those for the self (Stone & Allgaier, 2008). In effect, self-other differences were found in instances where risk-taking was valued by others. However, not much is known about social values in the financial domain and

whether they change according to the significance of the decision. However, there is evidence that risk-aversion is valued in physical safety scenarios (Stone, Choi, de Bruin, & Mandel, 2013), but to our knowledge this has not been observed in medical scenarios.

Discrepancies between the financial and medical domains

Our predictions can account for the discrepancies in findings between the financial and medical domains, which we will focus on in this study. Findings in the medical domain have consistently showed that people take less risk for others, but financial studies have not been consistent: some show that we take more risks for others than ourselves (Batteux, Ferguson, & Tunney, 2017; Chakravarty, Harrison, Haruvy, & Rutström, 2011; Mengarelli, Moretti, Faralla, Vindras, & Sirigu, 2014; Pollmann, Potters, & Trautmann, 2014; Polman, 2012), others that we take less risks for others (Eriksen & Kvaløy, 2010; Füllbrunn & Luhan, 2015; Reynolds, 2009), and some report no self-other difference (Benjamin & Robbins, 2007; Eriksen, Kvaløy, & Luzuriaga, 2017; Stone, Yates, & Caruthers, 2002).

There are important outcome differences to consider between the studies conducted in each domain. Medical studies have focused on decisions which have much more significant consequences than financial ones. However, it is conceivable that self-other differences may not be as robust when the outcome is less important. In the financial domain, almost all studies have focused on relatively small amounts of money, which might not elicit the same feeling of responsibility in the decision-maker, perhaps contributing to discrepancies in findings. Further research into important financial decisions is needed to compare self-other differences across domains, but also given that a crucial motivation for understanding financial surrogate decisions is their implication in the financial crisis of 2007-2008. Indeed, it is generally accepted that excessive risk-taking by people acting on behalf of investors was a causal factor in the crisis (Andersson, Holm, Tyran, & Wengström, 2013; Eriksen, Kvaløy, & Luzuriaga,

2017; Füllbrunn & Luhan, 2015), which might not have been the case if investors had been managing their own money.

The present research

We conducted three experiments to explore the effects of frame and outcome magnitude on surrogate risk preferences. To test whether the risk-as-feelings hypothesis can account for self-other differences for small outcomes, we compared decisions made in a gain frame to decisions in a loss frame. We expected that surrogate decisions would be closer to risk-neutrality than decisions for the self. For large outcomes, we expected that surrogate risk-taking would decrease across both gain and loss frames. We predicted a strong version of the cautious shift hypothesis whereby this would lead to decisions for others being less risk-taking than decisions for the self.

In Experiment 1a, participants made monetary choices between risky and safe options, once in a gain frame and once in a loss frame. Crucially, one group made choices about small outcomes and another about large outcomes. Given that large outcomes cannot be converted to participant payments, we could not use contingent payments in Experiment 1a, as would usually be done in the literature. We therefore also present Experiment 1b which replicates the small magnitude condition in Experiment 1a with the addition of performance contingent payments. In Experiment 2, participants were asked to make treatment choices in scenarios which either depicted an illness (loss frame) or a health improvement (gain frame). Both large and small outcome magnitudes were presented in each condition. We decided to investigate financial and medical decisions in separate experiments given the difficulty in conceiving scenarios that are directly comparable across both domains.

Experiment 1a

Experiment 1a explores the effects of frame and outcome magnitude on surrogate financial decisions. In the small magnitude condition, we predict that participants will be more risk-neutral for someone else than for themselves. Evidence from financial studies suggest that people become more risk-averse for themselves as the outcome magnitude increases in a gain frame (Bornovalova et al., 2009; Myerson, Green, & Morris, 2011) but not in a loss frame (Estle, Green, Myerson, & Holt, 2006; Mitchell & Wilson, 2011). We therefore predict that in decisions for the self, outcome magnitude will decrease risk-taking in the gain but not the loss frame. In decisions for another person, we expect that the large magnitude decisions will encourage a cautious shift and lead to an overall decrease in risk-taking relative to surrogate decisions with small outcomes, as well as relative to decisions for the self. Given that we predict an interaction between recipient and frame with small magnitudes but not with large magnitudes, we are therefore predicting a three-way interaction between recipient, frame and magnitude.

Method

Design. A 2 (Recipient) x 2 (Frame) x 2 (Magnitude) mixed design was used. Recipient and Frame were within-subject factors whereby all participants made a series of choices in a gain frame and in a loss frame, once for themselves and once for another person. The order in which each condition was presented to participants was randomised and counterbalanced. Magnitude was a between-subjects factor where one group made choices concerning small amounts of money and another group made choices concerning large amounts of money. The dependent variable was the percentage of risky choices.

Participants. Participants (n=120) were recruited online via Prolific (http://prolific.ac). The age group ranged from 18 to 36 (M=26.86, SD=4.41). There were 45 males and 74 females with varying levels of education. All participants resided in the United Kingdom to ensure that the currency used (£) in the task was relevant to all. Ethical approval was obtained from the ethics committee at the University of Nottingham.

Choice task. The task involved making a series of choices between a guaranteed win or loss and a chance of winning or losing an amount of money. One series of choices was framed as a win and the other as a loss. Participants made both series of choices once for themselves and once on behalf of a stranger. They were told to imagine that they were making decisions for another participant in the experiment. Half of the participants were in the small magnitude condition where the amounts to win or lose varied from £5 to £100. The other half were in the large magnitude condition where the amounts to win or lose vary from £50,000 to £1,000,000. Participants completed the task four times (self-gain, self-loss, other-gain, other-loss) and were always presented with the same outcome magnitude. The order of presentation of each condition was randomised. There were 16 trials per condition which were presented in random order. All trials were composed of a choice between a risky option and a sure option. The risky option was of a probability (20%, 40%, 60%, 80%) of winning or losing an amount (£25/£250000, £50/£500000, £75/£750000, £100/£1000000). The sure option was the expected value of the risky option it was paired with.

Results

We entered the percentage of risky choices participants made in each condition into a 2 (Recipient) x 2 (Frame) x 2 (Magnitude) mixed model ANOVA (see Figure 1). There was a main effect of recipient ($F_{1,118}$=5.685, MS_e=442.900, p=.019, η_p^2=0.046): participants chose

the risky option more often for someone else than for themselves. There was a main effect of frame ($F_{1,118}$=25.756, MS_e=919.011, p<.001, η_p^2=0.179): participants chose the risky option more often in the loss frame than in the gain frame. There was also an interaction between recipient and frame ($F_{1,118}$=12.464, MS_e=213.568, p=.001, η_p^2=0.096).

We conducted planned comparisons using paired samples t-tests, with Bonferonni corrections, to investigate whether our prediction was supported. These showed that participants took more risks for others than themselves with large magnitudes (t_{58}=-3.773, p<.001, d=0.56) but not with small magnitudes (t_{60}=-1.597, p=.115, d=0.19). There were no self-other differences in the loss frame in neither the small (t_{60}=0.597, p=.552, d=0.06) nor the large magnitude condition (t_{58}=-0.412, p=.682, d=0.05). We further explored the magnitude effect in the gain frame and found that it was driven by a difference in risk-taking for the self between the small and large magnitude groups in the gain frame (t_{118}=3.980, p<.001, d=0.72), which was not significant between the groups when choices were made for others (t_{118}=1.391, p=.167, d=0.25).

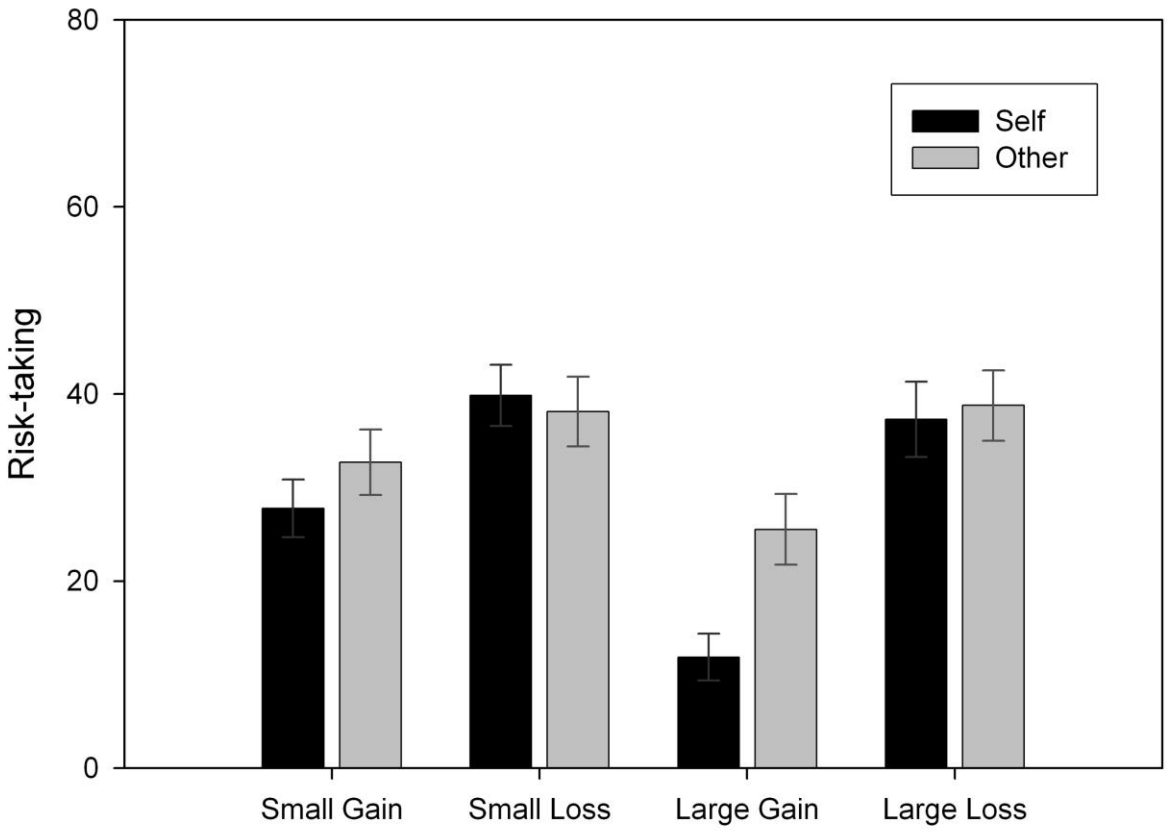

Figure 1: Percentage of risky choices participants made in each condition. Error bars represent the standard error of the mean.

Discussion

Self-other differences were apparent in the gain frame, but were only statistically reliable when the choices concerned large outcomes. Neither the recipient nor the outcome magnitude had an effect on choices made in a loss frame. These findings are consistent with previous literature on the effect of outcome magnitude on risky choices for the self (Estle et al, 2006) and present new evidence that such an effect is absent, or at least much smaller, when people make choices for others. Contrary to expectations, for small magnitudes, we did not find evidence that surrogate choices were more risk-neutral for others, but there was a trend towards

increased risk-taking in the gain frame. For large magnitudes, we did not find evidence of a cautious shift for others.

Experiment 1b

In Experiment 1b, we aim to replicate findings from the small magnitude condition in Experiment 1a to assess whether they remain the same when choices are about real, rather than hypothetical, monetary outcomes.

Method

Design. A 2 (Recipient) x 2 (Frame) within-subjects design was used. Participants made a series of choices in a gain frame and in a loss frame, once for themselves and once for another person. The dependent variable was the percentage of risky choices.

Participants. Participants (n=48) were recruited from the University of Nottingham. A sample size of 48 enables the detection of an interaction between frame and recipient with a medium effect size (d=0.05, as found in Experiment 1a) with adequate power (>.80) and an acceptable alpha level (<.05). The age group ranged from 18 to 83 years (M=23.93, SD=9.53). There were 13 males and 35 females. Ethical approval was obtained from the ethics committee at the University of Nottingham.

Choice task. The task was performed on a computer using PsychoPy (Peirce, 2007) and consisted of four conditions: gain-self, gain-other, loss-self, loss-other. The order of presentation of each condition was counterbalanced across participants. All trials consisted of making a choice between a sure option and a probabilistic option using the 'up' and 'down' arrow keys. The trials were presented in blocks of probabilities, in descending order for half

the participants and ascending order for the other half, within which the sure options were presented in descending order. There were 11 sure options, either framed as a win or loss (£95, £85, £75, £65, £55, £45, £35, £25, £15, £10, £5), and 7 sets of probabilities of winning or losing £100 (95%, 90%, 70%, 50%, 30%, 10%, 5%).

Participant compensation. A participant's compensation was the sum of the outcomes of four choices: two choices that participant made for themselves, one in the gain frame and one in the loss frame, and two choices that the previous participant made for them, one in the gain frame and one in the loss frame. Only a proportion of that sum was received and was set so that bonus payments were on average £2 on top of an inconvenience allowance of £1. Participants were clearly told that one of the trials in each condition was real – a proportion of its outcome would constitute part of its recipient's compensation. They were not told which choice was real, but it was set as the choice between a '£45 win and a 50% of winning £100' in the gain frame and the choice between a '£5 loss and a 5% chance of losing £100' in the loss frame, so as to make sure that participants ended up with a bonus payment.

Results

We entered the percentage of risky choices participants made in each condition into a 2 (Recipient) x 2 (Frame) repeated measures ANOVA (see Figure 2). There was a main effect of recipient ($F_{1,47}$=12.067, MS_e=87.148, p=.001, η_p^2=0.204): participants chose the risky option more often for someone else than for themselves. There was an interaction between recipient and frame ($F_{1,47}$=6.696, MS_e=87.321, p=.013, η_p^2=0.125). Paired samples t-tests, with Bonferroni corrections, showed that there were no self-other differences in the loss frame (t_{47}=-0.658, p=.514), but that participants took more risks for others than themselves in a gain frame (t_{47}=-4.089, p<.001, d=0.45).

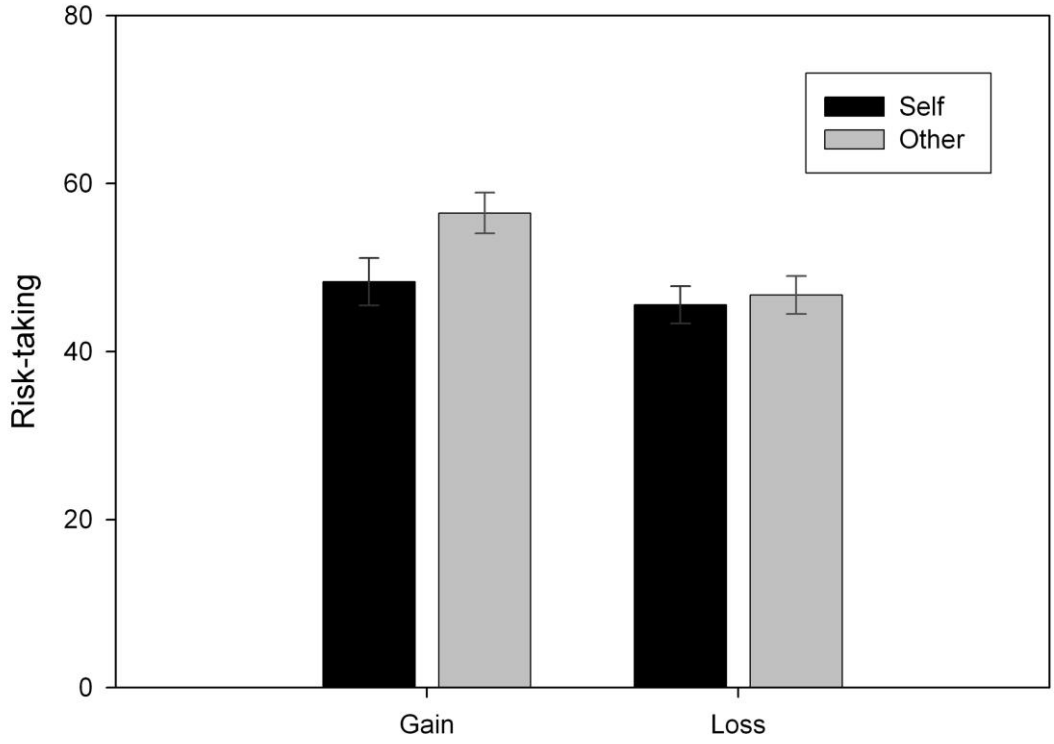

Figure 2: Percentage of risky choices participants made in each condition. Error bars represent the standard error of the mean.

Discussion

Self-other differences in Experiment 1b were similar to those observed in Experiment 1a in the large magnitude condition: a medium effect of recipient in the gain frame and no effect in the loss frame. This suggests that using real rewards increased the significance of the choices made relative to hypothetical rewards, just like using large outcomes does relative to small outcomes. This implies that the self-other differences we observed in Experiment 1a with large magnitudes might in fact be more pronounced when the outcome is real.

Experiment 2

In Experiment 2, we investigated how surrogate risk-taking changes according to frame and outcome magnitude in medical scenarios. For large magnitudes, we expected to find a cautious shift for others, as put forward in the literature. As for the financial domain, we conjectured that we would find an effect of frame for small magnitudes. Treatment decisions can be considered to be made in a loss frame: if a person is in a state of health that requires treatment, they are at a loss compared to their usual state. On the other hand, a decision to be vaccinated against an illness or disease can be considered to be made in a gain frame, as it would result in a gain relative to one's reference point. Nevertheless, both types of decisions refer to illnesses which might push participants towards a loss frame. We therefore decided to investigate health benefits as the gain frame rather than avoiding impaired health. We used the QALY (quality-adjusted life years) standard gamble (SG) method commonly used to measure the utility of health outcomes (Whitehead & Ali, 2010). It is designed to measure utility under risk for a particular medical condition by presenting a choice between a safe option (staying in that condition) and a risky option (taking a risky treatment). We used it for the loss condition and adapted it for the gain condition.

Method

Design. A 2 (Recipient) x 2 (Frame) x 2 (Magnitude) mixed design was used. Recipient was a within-subjects factor where participants made decisions for themselves and for another participant. Frame was a between-subjects factor where participants were placed in either a loss or a gain frame. The way we manipulated this was to present participants with scenarios which could either improve their present health (gain frame) or scenarios where their present health is impaired (loss frame). We therefore assume that placing participants in a positive or negative situation relative to their present reference point will nudge them into a gain or a loss

frame. Magnitude was a within-subjects factor where participants were presented with scenarios of large and small magnitudes.

Participants. Participants (n=72) were recruited from the University of Nottingham. The age group ranged from 19 to 59 (M=24.55, SD=6.74). There were 23 males and 49 females. Ethical approval was obtained from the ethics committee at the University of Nottingham.

Choice task. Participants completed the experiment on a computer using PsychoPy (Peirce, 2007). They were presented with six scenarios (three large magnitude scenarios and three small magnitude scenarios, see Appendix). In the loss frame, two of the large magnitude scenarios (paraplegia and Broca's aphasia) were adapted from Rosen, Tsai, and Downs (2003) because they elicited low utilities, to which we added a vegetative state scenario. Angina was used as a small magnitude scenario because it elicited high utilities in Read, Quinn, Berwick, Fineberg, and Weinstein (1984), to which we added a headache and a nausea scenario. In the gain frame, two of the three large magnitude scenarios (vision and fitness) were taken and adapted from Chapman and Johnson (1995) as they elicited high utilities, to which we added the sleep scenario. Two of the small magnitude scenarios (no cold and headache pills) were also taken and adapted from Chapman and Johnson (1995) as they elicited low utilities, to which we added the weight loss scenario.

The participants completed each scenario twice: once for themselves and once deciding for another unknown participant who they were told was also a student. In the loss frame, participants were given the choice between a safe option: remaining in a condition (paraplegia, Broca's aphasia, vegetative state, angina, headache, nausea) and a risky option: a treatment with a probability p of complete recovery and a probability 1-p of death. The probability p in the risky option was presented in descending order (100%, 95%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%, 5%, 0%) until respondents switched from choosing the risky option to the safe option. In the gain frame, participants were given the choice between a safe option:

receiving a treatment (extra sleep, increased fitness, better vision, no cold, headache pills, weight loss) and a risky option: receiving a better treatment with a success rate of probability p and a probability 1-p of failure (nothing happening). The probability p in the risky option was presented in descending order (100%, 95%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%, 5%, 0%) until respondents switched from choosing the risky option to the safe option.

Results

We computed participants' utilities of the medical scenarios for each recipient by taking the point at which they are indifferent between taking the risky option or the safe option. The indifference point is the average of the two probabilities either side of the crossover point from the risky to the safe option. Utilities varied between 0 and 1 where 0 indicates that they always chose the risky option and 1 indicates that they always chose the sure option. We then averaged utilities for large magnitudes and small magnitudes in each frame to have an overall utility for each magnitude.

We entered these utilities in a 2 (Recipient) x 2 (Magnitude) x 2 (Frame) mixed model ANOVA where recipient and magnitude were within-subjects factors and frame was a between-subjects factor (see Figure 3). There was a main effect of recipient: participants were more risk-averse for someone else than for themselves ($F_{1,70}$=8.230, MSE=0.014, p=.005, η_p^2=0.105). However, there was an interaction between recipient and frame ($F_{1,70}$=6.973, MSE=0.014, p=.010, η_p^2=0.091), which was qualified by a three-way interaction between recipient, magnitude and frame ($F_{1,70}$=4.427, MSE=0.005, p=.039, η_p^2=0.059).

Paired-samples t-tests revealed that the self-other differences driving these interactions were the utilities for the large magnitude scenarios in the loss frame, where participants were more risk-seeking for themselves (M=0.42, SD=0.19, CI [0.35, 0.48]) than for someone else

(M=0.53, SD=0.20, CI [0.47, 0.60]) (t_{35}=-4.082, p<.001, d=0.56). The self-other difference for small magnitude scenarios in the loss frame was not significant (t_{35}=-1.553, p=.130, d=0.17).

There was also a main effect of magnitude: participants were more risk-averse for small than large magnitudes ($F_{1,70}$=39.759, MSE=0.012, p<.001, η_p^2=0.362). There was an interaction between magnitude and frame: there was an effect of magnitude in the loss but not the gain frame ($F_{1,70}$=67.543, MSE=0.012, p<.001, η_p^2=0.491). Finally, there was an interaction between magnitude and recipient, whereby there was an effect of recipient or large but not small magnitudes ($F_{1,70}$=6.031, MSE=0.005, p=.017, η_p^2=0.079).

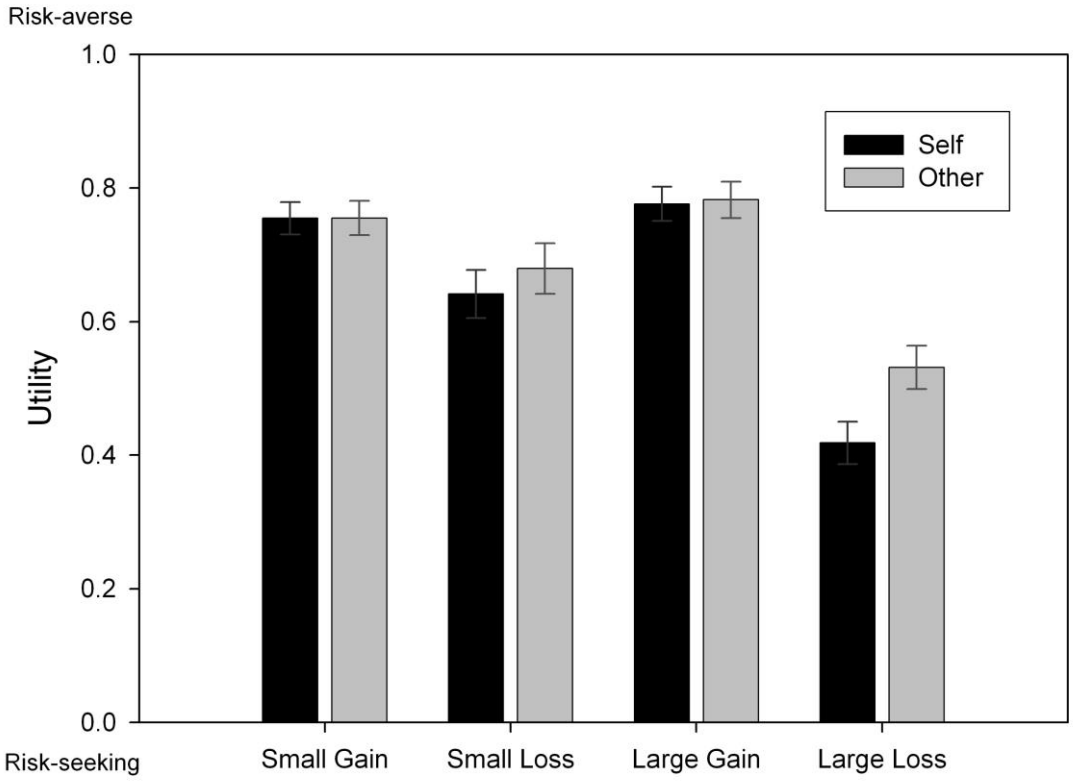

Figure 3: Average utility across participants for each recipient, frame and outcome magnitude. Error bars represent the standard error of the mean. The higher the utility, the less risk participants took.

Discussion

Surrogate decisions were more risk-averse than people's own decisions supporting the hypothesis that medical scenarios elicit a more cautious approach to surrogate decision-making. However, this effect was largely driven by the self-other difference in the loss frame for large magnitudes. For small magnitudes, we did not find the predicted effect of frame and the risk-as-feelings hypothesis was not supported. We therefore replicated results found in the literature, but did not show that the cautious shift was maintained in a gain frame or for small magnitudes.

General discussion

Our findings lend support to the idea that surrogate decisions vary according to their specific features and the context in which they are made. In both the financial and medical domains, the significance of the outcome of the decision affects self-other differences. To the best of our knowledge, this is the first study to directly compare small and large outcomes for financial and medical surrogate decisions. However, our predictions that the risk-as-feelings hypothesis would manifest itself with small magnitudes and the cautious shift hypothesis with large magnitudes were not supported. This means that the differences in findings between the financial and the medical domain in previous studies cannot be explained by differences in outcome magnitude alone. Indeed, we find that outcome magnitude has diverging effects on surrogate choices in each domain.

For financial decisions, we found that outcome magnitude does affect self-other differences, but that this is due to an effect on people's own choices rather than their surrogate choices. The crucial implication is that people are more willing to take risks for someone else than they would for themselves in situations where large amounts of money are at stake (for gains at least). This lends support to the concern raised in the aftermath of the financial crisis

that agents acting on behalf of investors are prone to higher risk-taking because they are removed from the outcome of their decisions. Notably, both large magnitudes and real outcomes enhanced self-other differences in the gain frame, which further highlights the impact of the significance of the decision on risk-taking. We also found that the frame of the decision has an effect on self-other differences. The risk-as-feelings hypothesis can explain increased risk-taking for others in a gain frame, but is at odds with the absence of self-other differences in a loss frame. The cautious shift hypothesis does not seem to be supported by our results, although it is conceivable that an effect of responsibility might actually increase risk-taking in a loss frame, in an attempt to divert responsibility for the outcome to chance and away from the decision-maker (Leonhardt, Keller, & Pechmann, 2011). Either way, a different account of self-other differences is required to understand their absence when decisions are made in a loss frame.

In the medical domain, participants took less risk for others than themselves when making decisions about severe illnesses. However, we did not find a significant reduction in risk-taking for minor illnesses, which suggests that the cautious shift might only occur for more important decisions. Although participants were more risk-taking in the loss than in the gain frame, self-other differences were not apparent in the gain frame. It could be that they did not judge those scenarios to be particularly significant, but rather perceived them as being of similar importance as the small magnitude scenarios in the loss frame. Instances of medical treatments which are administered in the absence of an illness are less common, and might therefore not be as salient and meaningful to participants. It is also for that reason that medical scenarios in a gain frame are difficult to construct, particularly in a way that can be compared to scenarios in a loss frame. We cannot exclude the possibility that the absence of self-other differences in a gain frame in our study is due to limitations with the ecological validity of the vignettes.

Why do we see a cautious shift in the medical domain but not in the financial domain? Firstly, this is the pattern that manifests itself in real-world decisions. Financial agents have been accused of excessive risk-taking with other people's money (Wengström, Andersson, Holm, & Tyran, 2013), whereas medical professionals have been pointed out to be more conservative when treating patients (Garcia-Retamero & Galesic, 2012). Interestingly, there seems to be an absence of accountability held against financial decision-makers when things go wrong (Koudijs, Salisbury & Sran, 2018), which stands in contrast to the rise in litigations against medical professionals which seem to explain their conservative choices (Garcia-Retamero & Galesic, 2012). Perhaps if financial decision-makers were similarly held accountable for their decisions, a cautious shift would be observed. It is possible that these variations in accountability manifested themselves when surrogates made their decisions in our study.

Secondly, the relationship between the surrogate and the recipient is different in financial and medical contexts. Medical professionals make decisions for patients who they interact with, which is not necessarily the case of financial decision-makers. There is therefore greater psychological distance (Trope & Liberman, 2010) between the surrogate and the recipient in financial than in medical decisions. It is conceivable that people would feel more accountable for decisions made for close others than distant others. This could also explain why we found that magnitude affected surrogate decisions in medical but not financial scenarios. In cases where a decision is psychologically distant, any additional dimension of psychological distance does not have much of an effect – there is a greater difference between near and far than far and further (Maglio, Trope, & Liberman, 2013). Given that deciding for someone else and deciding for large magnitudes can both be thought of as dimensions of psychological distance, it follows that outcome magnitude would have less of an effect of financial than medical surrogate decisions. Although participants received the same information about the recipient

in both our financial and medical scenarios, it would make sense that they would draw on real life experiences on these decisions to inform their process.

In both domains, the self-other differences we found were with large but not small outcome magnitudes. It is therefore conceivable that the inconsistent findings in the financial domain were due to the focus on small magnitudes, whereas the consistent findings in the medical domain were due to the focus on large magnitudes. Notably, this finding is contrary to what has been reported in the interpersonal domain which has found the opposite effect of outcome magnitude (Beisswanger et al., 2003; Stone & Allgaier, 2008), indicating another difference between domains. The effect of frame was also divergent between domains: self-other differences were found in the gain frame for financial decisions, but in the loss frame for medical decisions. It is possible that this could have something to do with the fact that financial decisions framed as a gain[1] and medical decisions framed as a loss are more likely than the converse, thereby making them more concrete and relevant to participants. In fact, according to Social Values Theory (Stone & Allgaier, 2008), self-other differences occur when a there is a social value attached to risk-taking, which will be followed when making a surrogate decision. Social values are perhaps less likely to have developed for instances of financial decisions framed as a loss and medical decisions framed as a gain.

Differences across domains are not new when it comes to people making decisions for themselves. Individuals' risk preferences are not constant across domains, which was been linked to the fact that they perceive the ratio between gains and losses to differ between domains (Zou & Scholer, 2016). In social and investment domains, people are more likely to

[1] Although most financial decisions can also lead to a loss, they are generally framed as a potential gain. The distinction we make here between gains and losses is more pronounced than what would occur in real-world scenarios. There is scope for future work involving decisions with both a gain and a loss component which can isolate their respective effects.

perceive the gains to outweigh the losses and take risks, which is not the case of the health domain. Additionally, when faced with affect-rich prospects (e.g. medical decisions), people tend to pay less attention to probabilities and focus more on outcomes than with affect-poor prospects (e.g. financial decisions) (Pachur, Hertwig, & Wolkewitz, 2014). It would be useful to know whether these findings translate to surrogate decision-making in order to further elucidate the domain differences we report here. Either way, this shows the difficulty in comparing surrogate decision-making between domains without taking these factors into account. Coupled with the present findings, this suggests that we cannot yet speak of self-other differences as if they were interchangeable between domains. More research is needed to unpick domain differences in a way that will allow for an overarching understanding of surrogate decisions across domains.

To conclude, the present study has contributed to closing the gap concerning the effect of outcome magnitude in surrogate decisions and has shed some new light on domain differences. In doing so, we have shown that any self-other differences that are present with small outcomes are magnified in the context of large outcomes. Future work should further explore the effects of particular decision features to gain a better understanding of real-world surrogate decision-making, which can present itself as highly complex. Finally, in light of the fact that self-other differences seem to be enhanced in real scenarios, this research would strongly benefit from being carried out in real-world contexts in order to draw conclusions about such instances of surrogate decision-making.

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Competing interests statement

The authors have no competing interests to declare.

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Appendix: Medical scenarios[2]

Gain frame: Large magnitude

Sleep: Imagine that you have the option of receiving a treatment which allows you to have an extra hour of sleep every night for the rest of your life. You would receive this extra hour without losing any time that you would spend on other activities. You would feel less tired, have more energy and better concentration. You also have the option of taking a gamble with the chance of getting an extra two hours of sleep a night for the rest of your life (without losing time for other activities), and a chance of nothing happening (and not receiving the first option).

Fitness: Imagine that you have the option of receiving a treatment which will give you the fitness of someone who goes to the gym five times a week, without having to go to the gym at all. This would improve your strength and cardiovascular fitness as well as make you healthier and less prone to illnesses. You also have the option of taking a gamble with the chance of having the fitness to compete in triathlons without much difficulty (meaning you would be even stronger and healthier than the first option), and a chance of nothing happening (and not receiving the first option).

Vision: Imagine that you have the option of receiving a treatment which would give you 20/20 vision for the rest of your life. This would mean that you would have normal vision and would never need glasses or contact lenses. You also have the option of taking a gamble with the chance of obtaining 20/10 vision which is better than 20/20 vision (seeing at 20 feet what

[2] The scenarios presented are worded as in the *self* condition. In the *other* condition, it was made clear that the other was another participant and all pronouns were changed accordingly.

a person with normal vision can see only when they are 20 feet away) and never needing glasses or contact lenses either, and a chance of nothing happening (and not receiving the first option).

Gain frame: Small magnitude

Cold: Imagine that you have the option of receiving a treatment which would prevent you from getting a cold for a winter. This would mean that you would not have any of the symptoms of a cold (sneezing, runny nose, sore throat, cough…) for the duration of an entire winter. You also have the option of taking a gamble with the chance of receiving a treatment which would prevent you from getting a cold and its symptoms for two entire winters, and a chance of nothing happening (and not receiving the first option).

Headache: Imagine that you have the option of receiving 3 pills which would definitely stop a headache. One of the pills would be sufficient to eradicate a headache entirely, meaning that with these pills you could stop 3 headaches. You also have the option of taking a gamble with the chance of receiving 6 pills which definitely stop a headache, and a chance of nothing happening (and not receiving the first option).

Weight: Imagine that you have the option of receiving a treatment which would allow you to lose 3 pounds (1.5 kilos). You would not have to change your eating habits or the amount of exercise you do. You would definitely keep these 3 pounds off for a year. You also have the option of taking a gamble with the chance of receiving a treatment which would allow you to lose 6 pounds (3 kilos) and keep them off for a year, and a chance of nothing happening (and not receiving the first option).

Loss frame: Large magnitude

Paraplegia: Imagine you suddenly develop paraplegia. You suffer from a complete loss of sensation and movement from the waist down, meaning that your legs are paralysed. You

are wheelchair-bound and you lose control of your bladder and your bowel. You require some assistance with self-care. Without treatment, there is no chance of recovery.

Broca's Aphasia: Imagine that you suddenly develop Broca's aphasia (a type of stroke). You will have a very difficult time speaking and writing. Nobody can understand you except for maybe the one or two people closest to you. This is very frustrating because you can understand other people but they don't understand you. You can speak a little but you have to work hard at it and most of the words you say will not make sense. Without treatment, there is no chance of recovery.

Vegetative State: Imagine you are the victim of an accident which leaves you in a vegetative state. You are bed-bound and need to be fed through a tube. You have almost lost all consciousness. You are unable to see, speak, and can barely think. You can hear and understand some of the things that are going on around you. You can slightly move your fingers meaning that you can occasionally communicate. There is no pain with this condition and without treatment, there is no chance of recovery.

Loss frame: Small magnitude

Angina: Imagine that you suddenly develop an angina. You have pain or discomfort in mainly in your chest but also in your upper body. You suffer from fatigue and occasional dizziness. You find breathing more difficult than usual. You can take medication to alleviate the symptoms but these are persistent and without treatment, there is no chance of recovery.

Headache: Imagine that you suddenly develop a persistent headache. You suffer from an aching head pain and a sensation of tightness or pressure across your forehead. You struggle to concentrate and the pain can render you unable to take part in your daily activities. Medication does not entirely relieve the pain and without treatment, there is no chance of recovery.

Nausea: Imagine that you develop an illness with symptoms of nausea. You often feel discomfort in your stomach and you are occasionally sick. This makes it more difficult for you to eat and get on with your day. You may be unable to work if the discomfort is too high. You can take medication to reduce the symptoms and without treatment, there is no chance of recovery.

Paper 3

Do we make decisions for other people based on our predictions of their preferences? Evidence from financial and medical scenarios involving risk

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Eleonore Batteux, Eamonn Ferguson & Richard J. Tunney

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Do we make decisions for other people based on our predictions of their preferences? evidence from financial and medical scenarios involving risk

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ABSTRACT

The ways in which the decisions we make for others differ from the ones we make for ourselves has received much attention in the literature, although less is known about their relationship to our predictions of the recipient's preferences. The latter question is of particular importance given real-world occurrences of surrogate decision-making which require surrogates to consider the recipient's preferences. We conducted three experiments which explore this relationship in the medical and financial domains. Although there were mean discrepancies between surrogate predictions and choices, we identified a predictive relationship between the two. Moreover, when participants took high risks for themselves, it seems that they were not willing to do so for others, even when they believed that the recipient's preferences were similar to their own. We discuss these findings relative to current theories and real-world instances of surrogate decision-making.

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KEYWORDS surrogate decisions; self-other differences; risk preferences; medical decision-making; financial decision-making; DMfO

Introduction

Background

Making a decision is often difficult given that the way it fulfils the decision-maker's goal can only be known in hindsight. Making the right decisions for other people, which we term surrogate decisions, can be even more difficult due to the fact that they are often made in the absence of knowledge

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of the recipient's wishes and values. Uncertainty concerning another's utilities is thereby added to the uncertainty of the decision-making process itself. Does that degree of uncertainty impact the way people make surrogate decisions or are we capable of predicting a recipient's wishes and preferences and making decisions accordingly? Do surrogates take into account these factors or do they take a different approach to making such decisions? These questions are essential to understanding how we make surrogate decisions, which is important given that a significant proportion of the decisions we make are for other people. We aim to address the latter question in this paper where we present three experiments which explore the relationship between decision-makers' predictions of a recipient's utility and the choices they make for the recipient. We present findings from two domains involving risk in order to assess how that relationship might change according to the content and context of the decision. We investigate the financial domain, where self-other differences are not yet clearly accounted for, and the medical domain, where the relationship between choices and predictions is highly relevant to real world medical decisions.

Although many surrogate decisions are relatively trivial, such as choosing a present, others involve life and death medical decisions. It is important to understand how surrogate decision-makers integrate the recipient's wishes and preferences into their decision process in these situations with high risks and stakes. When a patient is deemed to have lost their decision-making capacity due to illness or injury, a surrogate (often next-of-kin) is asked to make a decision on their behalf. These surrogates are usually instructed to make a decision that is in the recipient's best interest whilst also following the substituted judgment standard, that is, making the decision the recipient would have made if they were able to do so. A twofold question therefore arises: can surrogates accurately predict the recipient's wishes and preferences, and if they can, are they guided by these predictions when formulating their decision? Concerning surrogate accuracy, Shalowitz, Garrett-Mayer, and Wendler (2006) showed in a systematic review that surrogates' predictions of patients' treatment preferences in hypothetical scenarios were accurate only 68% of the time[1]. In terms of whether surrogates take into account these preferences, qualitative research suggests that surrogates experience a conflict between wanting to make a decision in accordance with the patient's values and factors such as preserving the patient's life or the family's well-being (Dionne-Odom, Willis, Bakitas, Crandall, & Grace, 2015; Schenker et al., 2012). These findings suggest that

[1]There are many other literatures that show that our predictions of others' preferences are often inaccurate, for example in gift giving (Galak, Givi, & Williams, 2016), willingness to pay (Frederick, 2012), the false-consensus effect (Ross, Greene, & House, 1977) and the egocentric anchoring and adjustment heuristic (Epley, Keysar, Van Boven, & Gilovich, 2004).

the substituted judgment standard may have unrealistic expectations of surrogates' decision-making, adding to the debate concerning its suitability (Torke, Alexander, & Lantos, 2008).

Theories and models of surrogate decision-making

Tunney and Ziegler's (2015) domain-general model of surrogate decision-making proposes that surrogate decisions are the result of perspective taking that varies according to the features of the decision. These features are expected to affect whether the decision maker is likely to engage in a simulated perspective (predicting what the recipient would do), a benevolent perspective (what the recipient should do), a projected perspective (what the decision-maker would do if they were the recipient), and/or an egocentric perspective (what the decision maker wants to do). In situations where the quality of the decision is largely determined by the recipient's own preferences (buying a present for example), if the decision maker knows the recipient well, a simulated decision is likely to be taken. However, if the decision maker possesses little information about the recipient, they might rely on a projected perspective. In situations where a high level of responsibility is placed on the decision maker, they might be inclined to take as much risk as they think is reasonable rather than how much risk they think the recipient would take: a benevolent rather than a simulated decision. Medical professionals for example are expected to adopt a more benevolent or egocentric perspective if they fear the professional or legal consequences of making the wrong decision, even if that means going against what the patient would want, whereas a surrogate for a next-of-kin may put more emphasis on a simulated perspective.

Theories specific to surrogate risk-taking do not speak of the relationship between surrogate predictions and decisions but can offer an account of their outcome. The Risk-as-Feelings hypothesis proposes that our subjective risk preferences are the result of emotional reactions to the risk rather than a purely cognitive evaluation of it (Loewenstein, Weber, Hsee, & Welch, 2001). In the context of surrogacy, the decision-maker is not the recipient of the outcome of the decision, thereby introducing psychological distance between the decision-maker and the outcome (Trope & Liberman, 2010). There is what is termed a self-other empathy gap (Loewenstein, 1996) which reduces the emotional involvement of the decision maker in the decision process. The decision-maker's emotional reactions to the prospect of a risk would therefore be reduced when making a surrogate decision compared to their own. It would follow, therefore, that surrogate decisions are closer to risk neutrality. Although such a hypothesis can help us understand how surrogate decisions differ from people's own decisions, it does

not admit the possibility that surrogate decisions could be in fact based on surrogate predictions which may themselves be closer to risk neutrality. Finally, Social Values Theory (Stone & Allgaier, 2008) proposes that self-other differences in decisions involving risk will arise because surrogate decisions are largely based on the social value placed on the risk, thereby acting as a norm. It is plausible that surrogates take into account whether risk-taking is socially valued or not, particularly when being held accountable or when making a decision for a stranger, but again this does not allow for the possibility that surrogates may take an approach that is largely based on a simulated perspective.

Surrogate decisions and predictions involving risk

In the financial domain, the literature on self-other differences is rather contradictory. There are findings suggesting that people are less risk averse for others than for themselves (Batteux et al., 2017; Mengarelli, Moretti, Faralla, Vindras, & Sirigu, 2014; Pollmann, Potters, & Trautmann, 2014; Polman, 2012), while others showing that people are more risk-averse for others (Eriksen & Kvaløy, 2010; Fernandez-Duque & Wifall, 2007; Zaleska & Kogan, 1971), as well as findings reporting no self-other differences (Benjamin & Robbins, 2007; Stone, Yates, & Caruthers, 2002). These findings concerning surrogate choices have been discussed relative to the Risk-as-Feelings hypothesis (Batteux et al., 2017; Fernandez-Duque & Wifall, 2007), reduced loss aversion (Mengarelli et al., 2014; Polman, 2012), increased caution due to responsibility (Zaleska & Kogan, 1971), and Social Values Theory (Stone & Allgaier, 2008). However, there has been little mention of the interplay between surrogate predictions and surrogate choices.

The question concerning the relationship between surrogate predictions and choices in financial decisions is one that can be posed given the similarities between predictions and choices. It has been found that people's surrogate predictions are closer to risk neutrality than the decisions they make for themselves, both in the domain of gains where people were risk averse but predicted someone else to be less risk averse as well as in the domain of losses where people were risk seeking and predicted that someone else would be less risk seeking (Faro & Rottenstreich, 2006; Hadar & Fischer, 2008; Hsee & Weber, 1997; Krishnamurthy & Kumar, 2002). Research has also shown that people's surrogate choices are closer to risk neutrality than the decisions they make for themselves in both gain and loss frames (Batteux, Ferguson, & Tunney, 2017; Sun, Liu, Zhang, & Lu, 2016; Zhang, Liu, Chen, Shang, & Liu, 2017; Ziegler & Tunney, 2015). Such findings suggest that perhaps in a financial context people make surrogate decisions in accordance with their predictions of what that person would do: they predict that person's risk preferences and choose

accordingly. However, it is difficult to establish whether similarities between predictions and choices can tell us anything about whether surrogates engage in simulated perspective-taking. In fact, Pahlke, Strasser, and Vieider (2015) show that in some instances, people make more risk-averse choices when choosing for themselves and someone else, as opposed to for themselves only, but report that they believe others are more risk-seeking than them. In the following paper, we add to this evidence by presenting an alternative way of investigating the relationship between surrogate choices and predictions which allows us to directly compare them.

When faced with hypothetical treatment scenarios, research indicates that decision-makers accept less risk for someone else than for themselves. This has been shown when doctors make decisions or recommendations for their patients (Garcia-Retamero & Galesic, 2012; Ubel, Angott, & Zikmund-Fisher, 2011). These differences might arise due to an effect of accountability whereby physicians feel the need to be able to justify their choices to others (Ubel et al., 2011) and fear the legal consequences of their decisions (Garcia-Retamero & Galesic, 2012), thereby reducing the risk they are prepared to take for a patient relative to themselves. This has also been found when people from the general population make decisions for a hypothetical patient or a family member (Dore, Stone, & Buchanan, 2014; Oliver, 2013; Petrova, Garcia-Retamero, & Van Der Pligt, 2016; Zikmund-Fisher, Sarr, Fagerlin, & Ubel, 2006), which has been discussed as the result of employing greater caution when making a decision for someone else (Oliver, 2013) and the need to justify one's decisions (Zikmund-Fisher et al., 2006), in which case maximising survival chances is easier to defend.

Concerning predictions, Garcia-Retamero and Galesic (2012) report that general practitioners predict their patients to either be more risk-seeking than themselves or have similar risk preferences but make more risk-averse choices for them than for themselves. They also find a positive correlation between doctors' own preferences and their predictions of patients', but none between their predictions of patients' preferences and the choices they make for them. This suggests on the one hand that there is a discrepancy between doctors' surrogate predictions and surrogate choices, and on the other that their predictions of a patient's risk preferences are related to their own preferences, which is a common finding across the medical literature (Fagerlin, Danks, Ditto, & Houts, 2001; Raymark, 2000). Similar results have been reported in a study where participants made more risk-averse vaccination decisions for a younger sister they were responsible for than for themselves, irrespective of the sister's preferences (Petrova et al., 2016). Our aim in this paper is to further explore the relationship between surrogate predictions and choices of ordinary decision-makers in order to understand how self-other differences arise in the medical domain when making

decisions for a stranger, whilst setting aside the professional and legal constraints felt by doctors when making such decisions.

There is also evidence that in relationship scenarios, young adults take more risks for others than themselves but believe that others would take the same level of risk as them (Stone & Allgaier, 2008). However, we believe that the scenarios described in each domain are different enough that findings from one domain cannot be assumed to translate to other domains. Indeed, individuals' risk preferences are not constant across domains (Zou & Scholer, 2016), nor do they attend to probabilities in the same way (Pachur, Hertwig, & Wolkewitz, 2014) or perceive the ratio between gains and losses to be equivalent (Zou & Scholer, 2016). Furthermore, Tunney and Ziegler's (2015) model of surrogate decision-making predicts that different features of the decision will impact perspective-taking. Different levels of accountability might be held against a medical and a financial decision-maker. The fact that self-other differences have been more consistent in the medical than the financial domain also suggests that there may be important differences between the two which should not be disregarded.

The present research

We present three experiments which explore the relationship between surrogate predictions and choices in both medical and financial domains when ordinary people make decisions on behalf of strangers. The way we investigate this is different from the literature in that we use a within-subjects design. This allows us to assess whether participants' surrogate predictions are predictive of their surrogate choices, instead of comparing choices and predictions in a between-subjects design. In doing so, we can infer whether surrogates might compute a simulated perspective when making their decisions, rather than inferring that they do not in light of discrepancies between choices and predictions. We can then compare decisions across domains in order to draw conclusions regarding whether surrogates are more likely to take a simulated approach in a particular domain.

We have two research questions which require different analyses. The first is whether surrogate predictions are predictive of surrogate choices. To answer it, we will conduct partial correlations between surrogate predictions and choices, controlling for choices for the self. We will also conduct multiple linear regressions with surrogate choices as an outcome variable and surrogate predictions and choices for the self as predictor variables. The second question is whether any self-other differences in choices can be accounted for by a perceived difference in participants' own choices and the recipient's choices. To answer it, we will conduct linear regressions with the self-other difference in choices as an outcome variable and the self-other difference in predictions as a predictor variable.

Experiment 1

In Experiment 1, we examine surrogate risk-taking in the financial domain. A number of potential explanations as to why self-other differences in decisions involving risk may arise in financial decisions have been proposed. The Risk-as-Feelings hypothesis suggests that the decisions we make for others will be closer to risk neutrality than our own. However, if surrogate decisions are based on surrogate predictions, we would again expect these to be closer to risk neutrality than our own decisions given the evidence mentioned above. Given that both suggested explanations would lead to similar outcomes, we need to investigate them in a way that can assess their relative contribution. We assessed self-other differences by asking participants to make a series of choices between two gambles, one with a high probability of winning a small amount and the other with a low probability of winning a large amount. Participants also completed a task where they were are asked to give a rating to each bet. The key manipulation is that participants are asked to predict the recipient's utility of each bet in order to identify whether surrogates' choices are coherent with their perception of the recipient's utility of the bets. In other words, do participants predict someone else's ratings of the bets to differ from their own? Moreover, is there a relationship between participants' predictions of someone else's ratings and the choices they make for them?

Method

Design

A 2 (Recipient) x 2 (Task) within-subjects design was used where participants complete a choice task and a rating task for themselves and for another participant.

Participants

Participants ($n = 36$) were recruited from the University of Nottingham. The age group ranged from 18 to 34 ($M = 21.97$, $SD = 3.57$). There were 12 males and 24 females. Ethics approval was obtained from the ethics committee at the University of Nottingham.

Stimuli

The stimuli were 27 pairs of bets, each made up of a P-bet and a £-bet. P-bets consisted of a high probability of winning a modest amount of money

and a low probability of losing a modest amount of money. £-bets consisted of a low probability of winning a large amount of money and a high probability of losing a modest amount of money. The stimuli were those used by Tunney (2006), with the only difference being that all amounts were multiplied by a factor of 10. Each pair had a very similar expected value, the highest difference being £3.75. Expected values varied between £11.70 and £43. The amounts that could be won varied between £15 and £500. The amounts that could be lost varied between £1.50 and £80. The amount to win in £-bets was always larger than in P-bets. In all bets, the amount that could be won was always higher or equal to the amount that could be lost.

Procedure

The experiment consisted of two sessions which were completed by participants 3-7 days apart. Participants made decisions for themselves in one session and for another participant in the other. The order in which participants completed the sessions was counterbalanced across participants. Each session was composed of two stages which were both completed on a computer using PsychoPy (Peirce, 2007). The first stage was the choice phase where participants made choices between the paired P-bets and £-bets. The second stage was the rating phase[2]. When making decisions for themselves, participants were asked to imagine that the bets were in the form of a lottery ticket and indicate the minimum selling price they would be prepared to sell the bet for, such that they would be indifferent to whether they played the bet or received the selling price instead. When making decisions for someone else, participants were asked to predict the minimum price they think that person would be prepared to sell the bet for. Bets were rated individually and presented in random order. The 6 bets which served as practice trials in the choice phase were also used as practice trials in the rating phase. To reiterate, participants were asked to make choices for another participant in the choice phase but predict what the recipient would do in the rating phase.

Participant compensation

Participants were told that the amount of money they would get as compensation would vary according to decisions made in the choice phase. For every participant, one of the bets they chose for themselves and one of the bets the previous participant had chosen for them was played for

[2]We call this task a rating task to differentiate it from the choice task. However, both tasks can be conceptualised as two different decision questions.

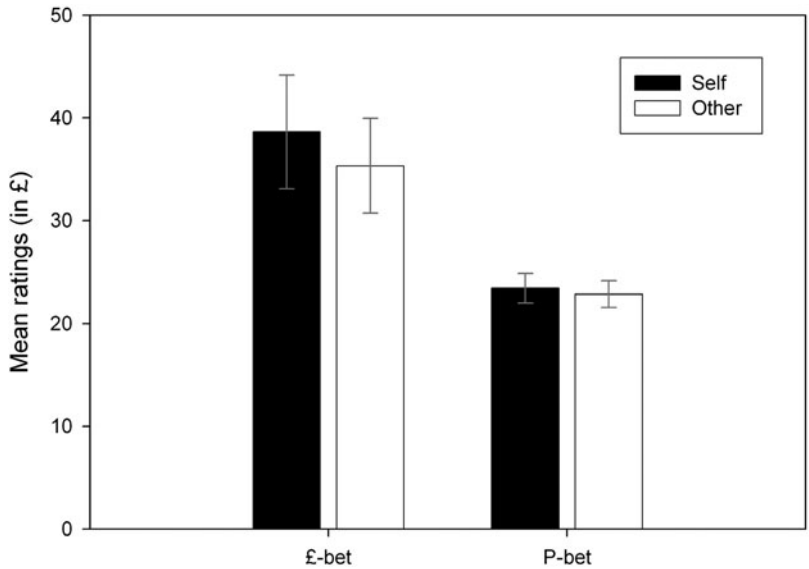

Figure 1. Means of participants' own ratings and their predictions of another's person's ratings of the £-bet and the-P bet (Experiment 1). Error bars represent the standard error of the mean.

real money. A small proportion of the amounts that were won (or lost) were added (or subtracted) to (or from) their initial inconvenience allowance of £4. The proportion of the amounts was adjusted so that participants would obtain on average £5. The bets that were played for real money were selected at random and participants were not told which ones they were.

Results

There were no differences between the proportion of P-bet choices for self (M = 0.76, SD = 0.24, CI [0.68, 0.84]) and for other (M = 0.76, SD = 0.24, CI [0.70, 0.82]) (t_{35}=0.093, p=.926). To assess whether participants predicted the other participant's ratings to be different to their own, we computed the mean rating for each type of bet in each condition (see Figure 1). Participants' own ratings and their predictions of another person's ratings were entered into a 2 (Recipient) x 2 (Type of Bet) repeated-measures ANOVA. There was no main effect of recipient ($F_{1,35}$=1.243, MS_e=108.047, p=.273). There was a main effect of type of bet ($F_{1,35}$=8.153, MS_e=845.808, p=.007, η_p^2=0.189): participants rated the £-bet higher than the P-bet. There was no interaction between recipient and type of bet ($F_{1,35}$=1.017, MS_e=66.617, p=.320).

We identified whether there was a relation between participants' predictions of other people's ratings of the bets and the choices they made for them using Pearson's correlations. We used the difference between ratings of the £-bet and ratings of the P-bet as a measure of ratings of the bets by subtracting P-bet ratings from £-bet ratings. There was no association between the proportion of P-bet choices for other and ratings of the bets ($r = 0.077$ [-0.266, 0.360][3], p=.657). We compared this to the relation between participants' own ratings and choices, where there was a negative correlation between the proportion of P-bet choices for self and ratings of the bets (r=-0.660 [-0.867, -0.251], p<.001). This means that the higher participants rated the £-bets relative to the P-bets, the more likely they were to choose them for themselves.

We then assessed whether surrogate predictions of ratings had a relationship with choices independently of participants' own ratings and choices. We performed a partial correlation between P-bet choices for other and ratings for other, controlling for P-bet choices and ratings for self, which was not significant ($r = 0.232$, p=.187). We also conducted a multiple linear regression, with surrogate P-bet choices as the outcome variable and ratings for other, ratings for self and P-bet choices for self as predictor variables. We found that the model was significant ($F_{2,32}$=4.477, p=.010) and accounted for 29.6% of the variance in surrogate choices. Surrogate predictions did not predict surrogate choices ($B = 0.003$, $SE = 0.002$, p=.187), nor did participants' own ratings ($B < 0.001$, $SE = 0.002$, p=.885). However, participants' own choices did ($B = 0.442$, $SE = 0.150$, p=.006). Participants' likelihood of choosing the P-bet for another person increases as their likelihood of choosing the P-bet for themselves increases.

Discussion

There were no self-other differences in choices and no differences between people's own ratings and their predicted surrogate ratings, suggesting that they predicted another person's utility of the bets to be similar to their own. The absence of self-other differences could be due to the fact that participants do not perceive the recipient's utility of the bets to be different to their own. We did not find a relationship between participants' surrogate ratings and choices. When participants predicted that another person would rate the £-bet highly, they did not show a preference for the £-bet when choosing on their behalf. This suggests that, in financial decisions, surrogates either do not compute the other person's utilities when making a decision on their behalf, or may not heavily rely on them, if at all. On the

[3]95% confidence intervals were obtained via 1000 bootstrapped samples.

other hand, it could be that the two different modes of preference elicitation lead to decisions that are not related, rather than surrogate predictions and choices not being related. This is coherent with literature on preference reversals, which shows that, like we found here, people favour the P-bet in the choice task but the £-bet in the rating task (Lichtenstein & Slovic, 1971). However, there was a relationship between participants' own ratings and choices. Rating the £-bet highly increased the likelihood of choosing it over the P-bet when making a decision for oneself, which means that the two modes of preference elicitation were related when participants decided for themselves. Therefore, our finding that they were not for others is indicative of the relationship between surrogate predictions and decisions.

Experiment 2

In Experiment 2, we examine the relationship between surrogate choices and predictions in medical scenarios. Participants were recruited from the general population in order to assess whether self-other differences observed in doctors for their patients also arise when ordinary people make decisions for others. We included both scenarios which depicted moderate and severe conditions. The decisions we presented in Experiment 1 had outcomes which were relatively small, and much smaller than scenarios in the medical literature. The health literature cited above includes scenarios of varying significance, from resulting in mild symptoms to death, but has not yet looked at whether less significant scenarios alters self-other differences. In the interpersonal domain, self-other differences have been found for low-impact but not high-impact scenarios (Beisswanger, Stone, Hupp, & Allgaier, 2003; Stone & Allgaier, 2008), suggesting that outcome significance might affect self-other differences in the medical domain.

We investigate self-other differences using the QALY (quality-adjusted life years) standard gamble (SG) task commonly used to measure the utility of health outcomes (Whitehead & Ali, 2010). The SG task is designed to measure utility under risk for a particular medical condition by presenting a choice between a safe option (staying in that condition) and a risky option (taking a risky treatment). We investigate predictions by adding a measure of utility without a risk component using the time trade-off (TTO) QALY task which elicits an expression of the participant's value of a particular medical condition. Surrogates are asked to predict the recipient's utilities in the TTO task and make choices for the recipient in the SG task. This allows for a comparison between surrogates' decisions under risk and their predictions of the recipient's value of the medical condition in order to evaluate

whether surrogate choices can be accounted for by the surrogate's perception of the recipient's value of the condition.

The reason we use the TTO task, rather than eliciting surrogate predictions in the SG gamble task, is to avoid interpretation difficulties if we find that surrogate choices and predictions are congruent, as in the financial literature, which could mean that surrogates are making a simulated decision, but it could also be the result of an attenuation of the participant's own risk preference in both cases or the participant's motivation for consistency. Using the TTO task does not eliminate all alternative explanations, but it does place the participant in a slightly different context when predicting the recipient's utilities, which can tell us something informative about surrogate predictions, independently from the surrogate choices made in the SG task. Given the literature, we do not anticipate self-other differences in surrogate predictions, but we do expect differences in surrogate choices, and therefore hypothesise that surrogate predictions cannot account for surrogate choices.

Method

Design. A 2 (Recipient) x 2 (Magnitude) x 2 (Task) repeated-measures design was used. The first factor 'Recipient' was a within-subjects factor where participants made decisions for themselves (self) and for another participant (other). The second factor 'Magnitude' was a within-subjects factor relating to the severity of the health state. The third factor 'Task' was a within-subjects factor, which refers to whether utilities were elicited via the SG or the TTO task.

Participants. Participants (n = 36) were recruited from the University of Nottingham. The age group ranged from 20 to 47 (M = 25.40, SD = 5.66). There were 10 males and 26 females. Ethics approval was obtained from the ethics committee at the University of Nottingham.

Materials and Procedure. Participants completed the experiment on a computer using PsychoPy (Peirce, 2007). They completed two different tasks which were designed to measure their utilities of each illness. Utilities were taken as measures of value or preference for health states and were bounded by 0 (prefer to die rather than live with condition) and 1 (indifferent between condition and full health). In both tasks, participants were presented with six scenarios (three moderate and three severe conditions, see Appendix). Two of the severe conditions (paraplegia and Broca's aphasia) were adapted from Rosen, Tsai, and Downs (2003) because they elicited low utilities, to which we added a vegetative state scenario. Angina was used as a moderate condition because it elicited high utilities in Read, Quinn, Berwick, Fineberg, and Weinstein (1984), to which we added a

headache and a nausea scenario. In all scenarios, it is specified that without treatment there is no chance of recovery. Participants completed each task twice: once for themselves and once for another unknown participant who they were told was also a student. The SG task measures how much risk participants are willing to take to recover, whereas the TTO task measures how many years of their life participants are willing to sacrifice to recover. The SG task measures risk preferences whereas the TTO task does not.

In the SG task, participants were given the choice between a safe option: remaining in a condition (paraplegia, Broca's aphasia, vegetative state, angina, headache, nausea) and a risky option: a treatment with a probability *p* of complete recovery and a probability 1-*p* of death. The probability *p* in the risky option was presented in descending order (100%, 95%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%, 5%, 0%) until respondents switched from choosing the risky option to the safe option. They made these choices once for themselves and once on behalf of another participants. In the TTO task, participants were asked to indicate how many years in full health were for them equivalent to 50 years with the disease. In other words, how many years of their life would they trade-off or sacrifice to live in full health. The years they would rather live in perfect health divided by 50 years was taken as the measure of utility. Crucially, when completing the task for another participant, they were asked to predict what the participant would do: in other words, how many years in full health would be equivalent for that participant to 50 years with the disease.

Half the participants completed both tasks for themselves first whereas half the participants completed both tasks for another participant first. Half the participants completed the SG task first in each block of recipient and half the participants completed the TTO task first in each block of recipient. In the SG task participants were asked to make choices on behalf of the participant, whereas in the TTO task participants were asked to predict what they think the participant would do.

Results

For responses in the SG task, we computed participants' utilities of the medical scenarios for each recipient by taking their indifference point between taking the risky option and the safe option. The indifference point is the average of the two probabilities either side of the crossover point from the risky to the safe option. Utilities varied between 0 and 1 where 0 indicates that they always chose the risky option and 1 indicates that they always chose the sure option. We then averaged utilities for moderate and severe conditions to have an overall utility for each magnitude. We converted responses on the TTO task to a utility that varied between 0 and 1,

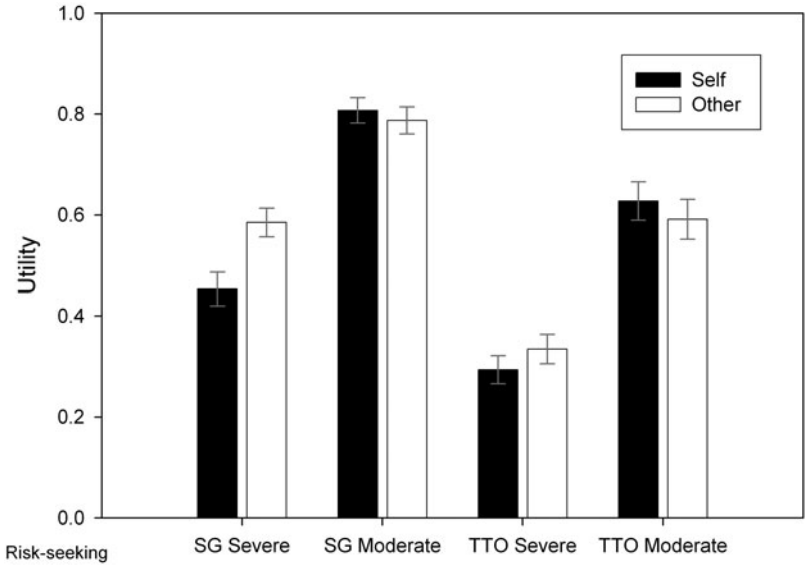

Figure 2. Average utility for each recipient, magnitude and utility estimation task with error bars representing the standard error of the mean (Experiment 2). Higher utilities indicate less risk-taking in the SG task and less life years sacrificed in the TTO task.

where 0 indicates that they would rather die than live at all with the condition and 1 indicates that they are not willing to sacrifice any life years to live in full health.

We entered these utilities in a 2 (Recipient) x 2 (Magnitude) x 2 (Task) repeated measures ANOVA (see Figure 2). There was a main effect of task ($F_{1,35}$=37.818, $MSE = 0.075$, $p<.001$, η_p^2=0.519), a main effect of magnitude ($F_{1,35}$=98.241, $MSE = 0.062$, $p<.001$, η_p^2=0.737). The main effect of recipient was not significant ($F_{1,35}$=2.986, $MSE = 0.022$, p=.093, η_p^2=0.079). Of primary interest, there was an interaction between recipient and task ($F_{1,35}$=6.044, $MSE = 0.016$, p=.019, η_p^2=0.147). According to a simple effects analysis, participants' utilities were higher for someone else than for themselves in the SG task (mean difference=-0.06, p=.025), but there were no differences on the TTO task (mean difference=-0.004, p=.804). There was also an interaction between recipient and magnitude ($F_{1,35}$=38.179, $MSE = 0.007$, $p<.001$, η_p^2=0.522). According to a simple effects analysis, participants' utilities were higher for someone else than for themselves for severe conditions (mean difference=-0.09, p=.001), but slightly lower for someone else for moderate conditions (mean difference = 0.03, p=.050). The interaction between recipient, task and magnitude was not significant ($F_{1,35}$=3.499, $MSE = 0.005$, p=.070, η_p^2=0.091).

To explore whether surrogate choices and predictions were related, we conducted Pearson's correlations between utilities in the SG and the TTO task. Surrogate choices in the SG task were positively correlated to surrogate predictions in the TTO task for severe conditions ($r = 0.503$ [0.272, 0.688], p=.002) but not for moderate conditions ($r = 0.061$ [-0.253, 0.388], p=.725). Similarly, for themselves, participants' utilities in both tasks were positively correlated for severe conditions ($r = 0.534$ [0.215, 0.763], p=.001) but not for moderate conditions (r=-0.127 [-0.431, 0.289], p=.461).

We then assessed whether surrogate predictions in the TTO task predicted surrogate choices in the SG task independently of participants' own choices in the SG task and ratings in the TTO task. Partial correlations between surrogate predictions and choices, controlling for self ratings and choices, were significant for severe conditions ($r = 0.606$, $p<.001$) but not moderate conditions ($r = 0.192$, p=.269). We also conducted a multiple linear regression with surrogate choices as the outcome variable and ratings for other, ratings for self and choices for self as predictor variables. For severe conditions, the model was significant ($F_{2,32}$=13.555, $p<.001$) and accounted for 56.0% of the variance in surrogate choices. Surrogate predictions positively predicted surrogate choices ($B = 0.668$, $SE = 0.155$, $p<.001$) and so did participants' own choices ($B = 0.551$, $SE = 0.119$, $p<.001$). On the other hand, participants' own ratings negatively predicted surrogate choices (B=-0.563, $SE = 0.183$, p=.004). For moderate conditions, the model was significant ($F_{2,32}$=8.677, $p<.001$) and accounted for 44.9% of the variance in surrogate choices. Surrogate predictions did not predict surrogate choices ($B = 0.021$, $SE = 0.178$, p=.908), nor did participants' own ratings ($B = 0.094$, $SE = 0.184$, p=.611), but their own choices did ($B = 0.714$, $SE = 0.141$, $p<.001$).

The fact that we used a within-subjects design suggests there might be contamination between the SG task and the TTO task. Participants who completed the TTO task first were asked to take the recipient's perspective before making a choice on their behalf. To evaluate whether the order in which participants completed both tasks affected the relationship between predictions and choices, we added the order in which participants completed the tasks as a predictor into the regression model with severe conditions. The model remained significant ($F_{4,31}$=9.858, $p<.001$) and accounted for 56.0% of the variance, but order was not a significant predictor (B=-0.006, $SE = 0.045$, p=.898). However, surrogate predictions ($B = 0.666$, $SE = 0.158$, $p<.001$), participants' own choices ($B = 0.544$, $SE = 0.132$, $p<.001$) and participants' own ratings (B=-0.562, $SE = 0.186$, p=.005) predicted surrogate choices. We also checked whether order was a predictor of the difference between surrogate predictions and choices for severe conditions. The model was not significant ($F_{1,34}$=0.347, p=.559).

Finally, we assessed whether participants' perceived difference between their own and the recipient's values in the TTO task could account for the self-other differences we found in the SG task. We conducted a linear regression with the difference between self and other on the SG task as the outcome variable and the difference between self and other on the TTO task as the predictor variable. Given that the relationship between predictions and choices differed by outcome magnitude, we ran two separate analyses. For severe conditions, we found that the model was significant ($F_{1,34}$=21.985, $p<.001$) and accounted for 39.3% of the variance in self-other differences in choices. The self-other difference in ratings was a significant predictor of the self-other difference in choices ($B = 0.798$, $SE = 0.170$, $p<.001$). For moderate conditions, the model was not significant ($F_{1,34}$=0.011, p=.916).

Discussion

In terms of surrogate decisions, they were more risk-averse than people's own decisions for severe medical conditions, which supports the hypothesis that medical scenarios elicit a more cautious approach to surrogate decision-making. However, they were slightly more risk-seeking than participants' own decisions for moderate conditions. This could be due to the fact that people were more risk-seeking for severe than moderate conditions and were not prepared to take that level of risk on behalf of the recipient. In terms of surrogate predictions, participants perceived the recipient's utilities of the medical conditions to be slightly lower than their own, indicating that there is a discrepancy between surrogate predictions and choices. For both severe and moderate conditions, we found that participants' own choices predicted their surrogate choices. Crucially, for severe conditions, surrogate predictions predicted surrogate choices independently of participants' own utilities. This suggests that predictions inform choices, even if they cannot fully account for the variance in choices. In other words, surrogates take into account their predictions of the recipient's utilities, but there are other factors driving the reduction in risk-taking. Other possibilities remain, however, such as it is in fact choices that inform predictions, or that they are both influenced by a common underlying mechanism. For moderate conditions, we did not find a relationship between predictions and choices for either self or other. It is therefore unclear whether surrogate predictions are not related to decisions for moderate conditions, or whether the SG and TTO tasks are more strongly related for severe than moderate conditions.

Experiment 3

Experiment 1 and 2 show that the relationship between surrogate choices and predictions differs between domains. In financial decisions, although we did not find self-other differences in either choices or ratings, surrogate ratings did not predict surrogate choices. In medical decisions, although we found conflicting self-other differences in choices and ratings, surrogate ratings did predict surrogate choices in the case of severe illnesses. This suggests that participants are integrating a simulated approach when making medical decisions but not financial decisions. We therefore conducted a third experiment with a larger sample size to directly compare the relationship between surrogate choices and predictions in both domains.

Although the specific choice trials were taken from Experiments 1 and 2, we had to make a number of amendments to their designs in order to conduct a feasible experiment. Firstly, we needed to ensure that we used a unique dependent variable that we could then enter in an analysis of variance. It was therefore difficult to use the ratings task from Experiment 1. Instead, we compared surrogate choices with surrogate predictions on the same task, meaning that participants completed the same task three times (self, other, predictions) in each domain, with preference for the safer option as the dependent variable. This also eliminates the interpretation difficulties that arise from using two different tasks to compare choices and predictions. Secondly, we wanted to make sure that the experiment was not too long in order to sustain participants' attention throughout and preserve the quality of the data. To this end, we selected particular trials from Experiment 1 (16 of the 24 choice trials) and Experiment 2 (severe conditions). The fact that participants completed three tasks per domain rather than four also contributed to shortening the experiment.

Method

Design

A 3 (Recipient) x 2 (Domain) within-subjects design was used where participants made choices for themselves, for another participant, and predicted what another participant would do. They made choices in the financial and medical domains.

Participants

Participants ($n = 80$) were recruited via Prolific. The age group ranged from 18 to 35 ($M = 27.51$, $SD = 5.11$). There were 23 males and 57 females with varying levels of education. All participants resided in the United Kingdom to ensure

that the currency used (£) in the task was relevant to all. Ethical approval was obtained from the ethics committee at the University of Nottingham.

Choice task

The financial choices consisted of 16 pairs of bets, each made up of a P-bet and a £-bet, taken from Experiment 1. We chose the bets that had the largest difference between the probabilities of the P-bet and of the £-bet, in order to further validate the P-bet as the safest option. The only difference was that all amounts were multiplied by a factor 10 in order to make the scenarios more significant to participants. The medical choices were identical to the SG task with severe conditions (paraplegia, Broca's aphasia, vegetative state) in Experiment 2.

Procedure

Participants completed each choice task three times: once for themselves, once for another participant, and once where they had to predict what the other participant would do. They were told to imagine that the other participant was of a similar age and situation to them. The order in which they completed each task (self-financial, other-financial, predict-financial, self-medical, other-medical, predict-medical) was randomised. The order in which they completed the trials within each task was randomised.

Results

Data pre-processing

In the financial domain, we took the proportion of P-bet choices as a measure of risk-taking. In the medical domain, we computed participants' utilities of the medical scenarios for each recipient by taking their indifference point between taking the risky option and the safe option. The indifference point is the average of the two probabilities either side of the crossover point from the risky to the safe option. Utilities varied between 0 and 1 where 0 indicates that they always chose the risky option and 1 indicates that they always chose the sure option. We then averaged utilities across medical conditions to have an overall utility. 5 participants were excluded from the analysis as an indifference point could not be computed from the choices they made because they were inconsistent (for example, choosing a treatment which has a 50% chance of working but not one which has a 70% chance of working). 75 participants remained in the analysis.

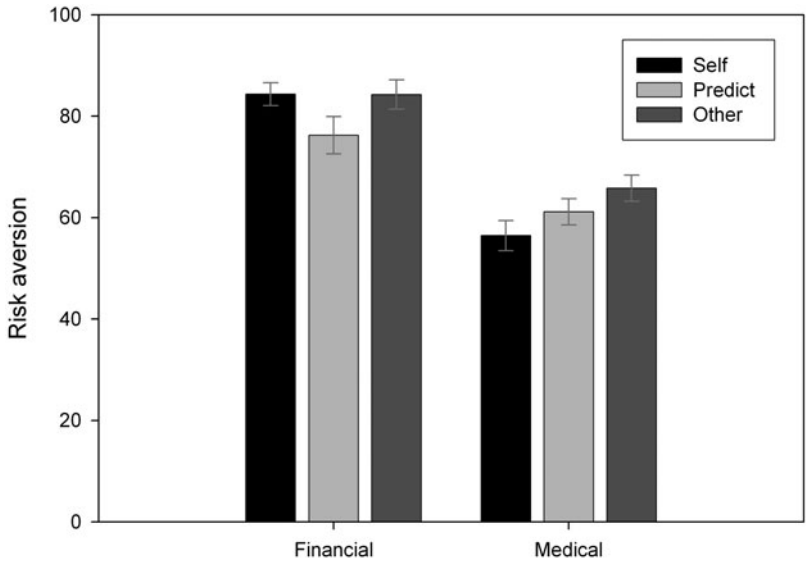

Figure 3. Participants' choices for each recipient by domain with error bars representing the standard error of the mean (Experiment 3). In the financial domain, higher values indicate a higher preference for the P-bet. In the medical domain, higher values indicate a higher preference for staying in the medical condition as opposed to taking the treatment.

Analysis of variance

We conducted our analysis with a 3 (recipient) x 2 (domain) repeated-measures ANOVA (see Figure 3). We did not expect to find an effect of recipient in the financial domain, given that we did not find self-other differences in Experiment 1. However, we did expect to find an effect of recipient in the medical domain whereby choices for the self and predictions of the recipient's choices are more risk-taking than surrogate choices. We therefore predicted a 2-way interaction between recipient and domain and use simple effects analyses to further analyse our results.

We found a main effect of recipient ($F_{2,148}$=5.100, MS_e=315.434, p=.007, η_p^2=0.064). Surrogate choices were more risk-averse than participants' own choices (mean difference = 4.628, p=.014) and surrogate predictions (mean difference = 6.328, p=.005), but there were no differences between participants' own choices and surrogate predictions (mean difference = 1.699, p=.417). We found a main effect of domain ($F_{1,74}$=47.921, MS_e=983.228, $p<.001$, η_p^2=0.393) whereby choices in the financial domain were more risk-averse than in the medical domain (mean difference = 20.465, $p<.001$). Crucially, we found an interaction between recipient and domain ($F_{2,148}$=5.390, MS_e=304.990, p=.006, η_p^2=0.068). In the financial domain, participants predicted that the recipient would be more risk-seeking than

them (mean difference = 8.083, p=.022, $d = 0.31$), yet were not significantly more risk-taking for the recipient than for themselves (mean difference = 0.083, p=.981, $d = 0.004$). Consequently, their surrogate choices and predictions were significantly different (mean difference = 8.000, p=.044, $d = 0.28$). In the medical domain, participants predicted that the recipient would be more risk-averse than them (mean difference = 4.684, p=.023, $d = 0.19$) and made more risk-averse choices for the recipient than for themselves (mean difference = 9.340, $p<.001$, $d = 0.38$). Surrogate choices were also more risk-averse than surrogate predictions (mean difference = 4.656, p=.016, $d = 0.21$).

We did not find self-other differences in the financial domain, but we did find that participants expect others to be more risk-taking than them. However, they seem to make similar decisions for them than they would for themselves. In the medical domain on the other hand, participants expect others to be more risk-averse than them and make more risk-averse decisions for them. Nevertheless, their surrogate decisions are more risk-averse than what they would predict the recipient's to be. We can conclude that there are discrepancies between surrogate choices and predictions, but that surrogate choices are more in line with surrogate predictions in the medical domain than they are in the financial domain.

Regression analyses

We performed Pearson's correlations to explore the relationship between surrogate choices and predictions. Surrogate choices and predictions were positively correlated in the financial ($r = 0.316$ [0.062, 0.562], p=.006) and the medical domain ($r = 0.732$ [0.586, 0.839], $p<.001$), although that relationship was much stronger in the medical domain. Partial correlations between surrogate choices and predictions, controlling for participants' own choices, were significant in the financial domain ($r = 0.292$, p=.012) and in the medical domain ($r = 0.333$, p=.004).

We then performed regression analyses to assess whether surrogate predictions were predictive of surrogate choices, independently of participants' own choices. In the financial domain, we found that the model was significant ($F_{2,72}$=4.002, p=.022) and accounted for 10% of the variance in surrogate choices. Surrogate predictions significantly predicted surrogate choices ($B = 0.249$, $SE = 0.096$, p=.012), but participants' own choices did not (B=-0.001, $SE = 0.158$, p=.996). In the medical domain, we found that the model was significant ($F_{2,72}$=80.337, $p<.001$) and accounted for 69.1% of the variance in surrogate choices. Surrogate predictions significantly predicted surrogate choices ($B = 0.292$, $SE = 0.098$, p=.004), but so did participants' own choices ($B = 0.513$, $SE = 0.085$, $p<.001$). The model accounted

for more variance in surrogate choices in the medical domain than it did in the financial domain.

We assessed whether participants' perceived difference between their own and the recipient's ratings could account for self-other differences in choices for each domain using a linear regression. In the financial domain, the model was significant ($F_{1,73}$=10.605, p=.002) and accounted for 12.7% of the variance in surrogate choices. Differences between surrogate choices and predictions were predictive of self-other differences in choices ($B = 0.355$, $SE = 0.109$, p=.002). In the medical domain, the model was significant ($F_{1,73}$=24.958, $p<.001$) and accounted for 25.5% of the variance in surrogate choices. Differences between surrogate choices and predictions were predictive of self-other differences in choices ($B = 0.440$, $SE = 0.088$, $p<.001$). Again, the model accounted for more variance in surrogate choices in the medical domain than it did in the financial domain.

Finally, we checked whether the order in which participants completed surrogate predictions and decisions was a predictor of the difference between the two. For each domain, we ran a 2 (Condition) x 2 (Order) ANOVA where condition had two levels (surrogate predictions and surrogate choices) and order had two levels (predictions first and predictions second). In the financial domain, there was a main effect of condition whereby choices were more risk-averse than predictions ($F_{1,73}$=4.342, MS_e=536.037, p=.041, η_p^2=0.056). We also found an interaction between condition and order ($F_{1,73}$=4.342, MS_e=536.037, p=.019, η_p^2=0.073). A simple effects analysis indicated that there were no differences between predictions and choices when predictions were completed first (mean difference=-1.182, p=.827), but there were when they were completed second (mean difference = 16.941, p=.001). Predictions were more risk-seeking than choices only when they were completed after choices by participants. On the other hand, the predictive relationship between predictions and choices appeared in both groups as shown by regression analyses. The model was significant for those that completed predictions first ($F_{1,36}$=6.454, p=.016) and those that completed predictions second ($F_{1,36}$=6.123, p=.017). In the medical domain, there was a main effect of condition whereby choices were more risk-averse than predictions ($F_{1,73}$=4.342, MS_e=135.084, p=.016, η_p^2=0.077), but there was no interaction between condition and order ($F_{1,73}$=0.951, MS_e=135.084, p=.333, η_p^2=0.013).

General discussion

Summary of findings

Across all three experiments, we generally found discrepancies between surrogate choices and predictions. Either self-other differences in choices

and predictions did not manifest themselves in the same way (i.e. same direction or magnitude), or we found a self-other difference in one but not the other. These discrepancies in mean values across participants are in line with findings from previous studies (Garcia-Retamero & Galesic, 2012; Stone & Allgaier, 2008; Stone, Choi, de Bruin, & Mandel, 2013). On the other hand, we were able to examine whether surrogate predictions are related to choices, which paints a different picture of their predictive relationship. Indeed, even in cases which presented these mean discrepancies, we found that surrogate predictions were predictive of surrogate choices. Interestingly, the only case in which we did not find such a relationship was in Experiment 1 where self-other differences in choices and predictions were similar.

This shows that concluding that surrogate choices are not informed by surrogate predictions from a mean difference might be misleading. The crucial difference here was that we used a within-subjects design[4] which allowed us to directly compare participants' predictions and choices. Without these analyses, we would not have been able to see the relationship between the two, and instead would have concluded that predictions and choices were at odds with one another. It is possible that this design encouraged participants to consider predictions in their choices, although we did not find order effects in Experiment 2. However, it is in fact more relevant to real-world occurrences of surrogate decision-making where surrogates are instructed to make a simulated decision and therefore do consider them.

Comparing surrogate decisions across domains

In the financial domain, we did not find any self-other differences. Although surrogates did not believe others would value each option offered by the choice differently (Experiment 1), they perceived others' choices to be more risk-seeking than their own (Experiment 3). Given that participants were risk-averse for both themselves and the recipient, our findings are consistent with previous studies that show that surrogates believe others make more risk-neutral choices than them (Faro & Rottenstreich, 2006; Hadar & Fischer, 2008; Hsee & Weber, 1997; Krishnamurthy & Kumar, 2002). Furthermore, we failed to find a relationship between surrogate choices and predictions in Experiment 1, but we did in Experiment 3. The difference between the two experiments was that predictions were elicited using

[4]The studies we presented here also manipulated the recipient as a within-subjects factor, which raises the possibility that self-other differences may be contingent on that manipulation. However, similar findings have also been reported using between-subjects designs in both the medical (Zikmund-Fisher et al., 2006; Ubel et al., 2011) and financial domain (Polman, 2012; Pollmann et al., 2014; Sun et al., 2016).

different tasks. This suggests that surrogates are integrating their perception of the recipient's risk preference in their decision-making (Experiment 3), but not their perception of the recipient's utility for each option of the choice separately (Experiment 1). Moreover, although there was no overall self-other difference in choices, we did find that the difference between participants' own choices and their predictions of someone else's was predictive of the self-other difference. Interestingly, we only found discrepancies between choices and predictions when participants completed predictions after choices in Experiment 3. This suggests that participants might have conformed their choices to their predictions when made after, but not the other way around. Nevertheless, this did not affect the relationship between surrogate predictions and choices.

In the medical domain, we found that the severity of the condition had an impact on self-other differences. Contrary to the interpersonal domain (Beisswanger et al., 2003; Stone & Allgaier, 2008), self-other differences were more pronounced for severe than moderate conditions, again suggesting that surrogate decisions are not directly comparable across domains. Our finding that decision-makers take fewer risks for someone else than for themselves when making decisions about severe conditions are consistent with the literature. We have also shown that ordinary decision-makers are more risk-averse for strangers. It could therefore be the case that surrogates tend to take fewer risks for others in the medical domain regardless of their role, but that doctors have additional responsibility and professional obligations which warrant a further reduction in risk-taking[5]. This shows that surrogates are more risk-averse for others regardless of whether they are a stranger or a close other (Zikmund-Fisher et al., 2006).

We found a clear relationship between surrogate predictions and choices for severe illnesses. Nevertheless, we still found differences between surrogate choices and predictions, which shows that surrogate choices are not completely accounted for. As with financial decisions, we find that participants' own choices have a strong relationship with their surrogate choices. However, there is still variability in surrogate choices that is unaccounted for. Given that surrogate choices were more risk-averse than surrogate predictions and people's own choices, we suggest that participants did not want to be accountable for taking a risk that would harm the recipient and therefore preferred to take a safer option; an account that has been explored with medical professionals (Garcia-Retamero & Galesic, 2012).

[5]Indeed, Garcia-Retamero, Okan, and Maldonado (2015) conducted a study with a student sample and found that they were more risk-seeking for a classmate than for themselves, which contradicts their previous findings with doctors using the same scenarios (Garcia-Retamero & Galesic, 2012). Notably, the severity of the illness depicted in the scenario they used was akin to that of our moderate conditions which slightly increased risk-taking.

Similarly, Petrova et al. (2016) found that participants made risk-averse choices for a hypothetical sibling irrespective of whether the sibling would have done so too, thereby suggesting that the predictive relationship between surrogate choices and predictions might have been weaker if there had been wider discrepancies between the two.

The relationship between surrogate choices and predictions was more consistent in medical decisions than in financial ones. However, the choices made in the financial domain were far less significant and life-changing, indicating that perhaps surrogates are more likely to incorporate a simulated approach when the significance of the decision is high. Indeed, surrogate predictions did not predict surrogate choices in financial decisions with small amounts (Experiment 1), but they did predict financial decisions with higher amounts or decisions for severe illnesses (Experiment 3). The interaction between the significance of the decision and the likelihood of making a simulated decision is therefore worth investigating.

Finally, across both domains, it does seem to be the case that surrogates are not willing to accept large risks on behalf of someone else, even when they would do so themselves and expect the recipient's utilities to be similar to their own. This is consistent with accounts of self-other differences based on caution when making decisions on behalf of someone else, due to the responsibility placed on the decision-maker and the uncertainty contained in making a decision in the absence of knowledge of the recipient's preferences. Nevertheless, we did not find that surrogates reduced their risk-taking for others when making financial decisions or decisions concerning moderate illnesses. This could mean that important decisions elicit a precautionary approach, but that less significant ones might not evoke a feeling of responsibility on the part of the decision-maker, who might put less thought into the decision process and therefore be more inclined to making a similar decision to their own. On the other hand, individuals may not be willing to take a high level of risk for someone else to avoid making a decision that risks causing harm to the recipient, either to avoid bearing that responsibility or due to moral and social values steering them in that direction. These accounts would benefit from being investigating in future research to better understand the domain differences we report here.

Theoretical implications

The present findings are best understood within the framework of Tunney and Ziegler's (2015) model of surrogate decision-making. The accountability held against the decision-maker and the significance of the decision are both factors that are taken into account by the model and expected to alter

surrogates' perspective-taking. In terms of perspective-taking, we found evidence suggesting that, when making decisions for a stranger, participants relied on a projected perspective. This follows from the model's prediction that surrogates would default to reproducing their own choices in the absence of knowledge about the recipient's preferences. Nevertheless, participants also seemed to take a simulated approach for financial and medical decisions of higher significance. Notably, the projected and simulated perspectives combined accounted for a much higher proportion of the variance in medical choices (69%) than in financial ones (10%), thereby indicating that the latter would benefit from further investigation. Alternatively, it is possible that the relationships we identified between surrogate choices and predictions or participants' own choices are the result of a common underlying mechanism, rather than reflecting participants' perspective-taking. Although our findings are consistent with the latter, more work is needed to ascertain that this is the case.

When participants accept more risk for themselves but lower risk for others, this could be interpreted as them taking a more benevolent approach – whereby they do not judge taking such a level of risk to be in the best interest of the recipient, or a more egocentric approach – where they do not want to be responsible for taking that risk. It is conceivable that the higher the significance of the decision and accountability of the decision-maker, the more likely it is that decision-makers take a cautious approach, thereby focusing on a more benevolent or egocentric perspective. The model also predicts that individuals who are higher in empathy will attribute more weight to a simulated perspective, which is supported by findings by Petrova et al. (2016). Moreover, when surrogates are familiar with the recipient's preferences, they are expected to be more likely to take a simulated decision. Future work should aim to address how individual differences and the identity of the recipient might affect the relationship between predictions and choices.

The Social Values Theory of surrogate risk-taking (Stone & Allgaier, 2008) emphasises the influence that social values can have on the decision process. It would make sense for high risk-taking to not be socially valued in a medical context, particularly amongst health professionals, which could account for why participants took fewer risks for others when making important treatment decisions. In fact, Stone et al. (2013) report that people take less risk for a friend in physical safety scenarios, even when they predict their friend to take the same level of risk as them. These results mirror ours and suggest that social values might be similar across physical safety and medical treatment scenarios. However, given our findings it seems unlikely that all surrogate decisions are driven solely by social values.

Conclusions and future directions

In this paper, we sought to investigate the relationship between surrogates' predictions of a recipient's utilities and the choices they make on their behalf. We did find support for a predictive relationship between surrogate predictions and choices. However, our findings indicate that self-other differences in decision-making cannot be solely accounted for by a perceived self-other difference in utilities. It would be interesting to examine whether this is also the case when surrogates are explicitly asked to make a decision based on the recipient's wishes and preferences. This would strengthen the conclusion that making a surrogate decision is a difficult task due to the responsibility placed on the decision-maker and the higher level of uncertainty relative to making one's own decisions, making it unlikely that they can accurately represent the recipient's wishes and preferences. Additionally, gaining more insight into the decision process through confidence measures and thought-listing techniques would further elucidate the decision process.

In order to develop a better understanding of how our study can speak to real-world scenarios, future research should build on it by using more realistic scenarios and investigating whether the present findings change when people make decisions for someone they are familiar with. Our findings can nonetheless speak to the wider research concerning surrogate decision-makers which shows that surrogates have a difficult time trying to reconcile the patient's wishes with a multitude of other perspectives and responsibilities (Dionne-Odom et al., 2015; Schenker et al., 2012), and that the substituted judgment standard is limited in helping surrogates make the right decision (Torke et al., 2008). On the other hand, it presents a more hopeful picture than previous research which indicated that decisions are not made in line with their predictions of the recipient's preferences.

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Declaration of interest statement

The authors declare no conflicts of interest.

Data availability statement

The data that supports the findings of this study are available from https://osf.io/tp8sg/.

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Appendix: Medical scenarios

Severe conditions

Paraplegia: Imagine you suddenly develop paraplegia. You suffer from a complete loss of sensation and movement from the waist down, meaning that your legs are paralysed. You are wheelchair-bound and you lose control of your bladder and your bowel. You require some assistance with self-care. Without treatment, there is no chance of recovery.

Broca's Aphasia: Imagine that you suddenly develop Broca's aphasia (a type of stroke). You will have a very difficult time speaking and writing. Nobody can understand you except for maybe the one or two people closest to you. This is very frustrating because you can understand other people but they don't understand you. You can speak a little but you have to work hard at it and most of the words you say will not make sense. Without treatment, there is no chance of recovery.

Vegetative State: Imagine you are the victim of an accident which leaves you in a vegetative state. You are bed-bound and need to be fed through a tube. You have almost lost all consciousness. You are unable to see, speak, and can barely think. You can hear and understand some of the things that are going on around you. You can slightly move your fingers meaning that you can occasionally communicate. There is no pain with this condition and without treatment, there is no chance of recovery.

Moderate conditions

Angina: Imagine that you suddenly develop an angina. You have pain or discomfort in mainly in your chest but also in your upper body. You suffer from fatigue and occasional dizziness. You find breathing more difficult than usual. You can take medication to alleviate the symptoms but these are persistent and without treatment, there is no chance of recovery.

Headache: Imagine that you suddenly develop a persistent headache. You suffer from an aching head pain and a sensation of tightness or pressure across your forehead. You struggle to concentrate and the pain can render you unable to take part in your daily activities. Medication does not entirely relieve the pain and without treatment, there is no chance of recovery.

Nausea: Imagine that you develop an illness with symptoms of nausea. You often feel discomfort in your stomach and you are occasionally sick. This makes it more difficult for you to eat and get on with your day. You may be unable to work if the discomfort is too high. You can take medication to reduce the symptoms and without treatment, there is no chance of recovery.

Appendix: Medical scenarios[1]

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[1] The scenarios presented are worded as in the *self* condition. In the *other* condition, it was made clear that the other was another participant and all pronouns were changed accordingly.

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Paper 4

Exploring how accountability affects the medical decisions we make for other people

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Exploring How Accountability Affects the Medical Decisions We Make for Other People

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In the event that a patient has lost their decision-making capacity due to illness or injury, a surrogate is often appointed to do so on their behalf. Research has shown that people take less risk when making treatment decisions for other people than they do for themselves. This has been discussed as surrogates employing greater caution for others given the accountability they are faced with. We tested the prediction that making accountability salient reduces risk-taking for others relative to the self by manipulating the information shown to participants while they made treatment choices. One group was asked to focus on the consequences for the recipient's family, another on the legal implications of their decisions, and another was not given additional information. Participants reduced their risk-taking for others compared to themselves, irrespective of the condition they were in. Although participants in each condition reported thinking about these factors to different extents, there were no clear differences in risk-taking between groups. However, we did find that, across all participants, thinking about legal consequences reduces risk-taking. We suggest that future research investigates how the effect of thinking about accountability on surrogate choices is mediated by feelings of accountability, in order to further examine the explanations suggested in the literature.

Keywords: surrogate decision-making, self-other differences, accountability, medical decision-making, DMfO

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INTRODUCTION

Making decisions on behalf of someone else is not an easy task and often places a high level of responsibility on the decision-maker, particularly in a medical context where the life of a patient is at stake. In the event that a patient is unable to make a decision for themselves due to illness or injury, medical decisions are often made by a surrogate in cases where the patient has not made a legally binding advance directive[1]. In the United States for example, family members are often burdened with making decisions in the intensive care unit, where only about 5% of patients are deemed able to make decisions for themselves (Radwany et al., 2009). If knowledge of the patient's wishes is available, the surrogate is instructed to make a decision that follows the substituted judgment standard – i.e., make the decision the recipient would have made for themselves, thereby putting aside their own wishes and preferences for the patient. On the other hand, in the absence of information about a patient's wishes, the best interests standard is followed – i.e., the best possible

[1]The specific instances and circumstances in which surrogate decisions are made vary depending on a country's legislation, thereby making more or less common from one country to the next.

outcome that provides the most benefit for the patient. Are surrogates able to take decisions that accurately represents the recipient's wishes and preferences, or are they influenced by other factors?

Qualitative research highlights that surrogates feel conflicted between making a decision that reflects the patient's wishes and factors such as preserving the patient's life or the family's well-being (Schenker et al., 2012; Dionne-Odom et al., 2015; Fetherstonhaugh et al., 2017). In terms of whether surrogates are actually capable of predicting their next-of-kin's treatment preferences, a systematic review showed that they were accurate only 68% of the time (Shalowitz et al., 2006). Interestingly, it seems that surrogates are biased toward predicting that a patient would want to be treated and are therefore more accurate in cases where the patients are favorable to treatment (Frey et al., 2014). Moreover, surrogates seem to have preferences regarding the procedure that should be followed when making a surrogate decision, which might in turn affect whether the substituted judgment is adequately followed (Frey et al., 2018). Taken together, these findings show that the substituted judgment standard is unlikely to be met in most cases, thereby adding to the debate concerning its suitability (Torke et al., 2008). What about the cases where surrogates do not know the wishes of the patient? In this paper, we theorize that the accountability placed on a surrogate will come into play and explore its influence on surrogate decisions in treatment scenarios involving risk.

For the purpose of this paper, we adopt a rather broad definition of accountability which refers to the answerability a decision-maker has – i.e., the responsibility for justifying their decisions. Accountability can manifest itself in a number of more specific ways. From a legal perspective, accountability would refer to being answerable to a court of law in the event that the decision-maker is accused of making an incriminating decision. This would presumably push the decision-maker toward making a decision that would not incriminate them. The decision-maker can also be held accountable in a more indirect manner – by the recipient themselves or the recipient's family for the harmful consequences of the decision. It is conceivable that this would push the decision-maker toward an empathic response that aims to minimize potential harm to the recipient and their family. We aim to investigate how consideration of these factors influences surrogate treatment decisions.

When doctors are faced with hypothetical scenarios in which they have to make treatment decisions or recommendations for their patients, research shows that they accept less risk for their patient than they do for themselves (Ubel et al., 2011; Garcia-Retamero and Galesic, 2012a; Janssen et al., 2015). Ubel et al. (2011) argue that these differences arise due to an effect of accountability whereby physicians feel the need to be able to justify their choices to others. Garcia-Retamero and Galesic (2012a) showed that doctors report that they fear the legal consequences of their decisions and thereby reduce the risk they are prepared to take for a patient relative to themselves. They also found that doctors did not make decisions that were in line with their predictions of the patient's risk preferences. These results highlight the role accountability plays in the way doctors reduce their risk-taking for their patients relative to themselves, which is not surprising given that litigation against medical professionals is on the rise (Garcia-Retamero and Galesic, 2012b).

However, this reduction in risk-taking is not exclusive to doctors. It has also been found when people from the general population make decisions for a hypothetical patient (Zikmund-Fisher et al., 2006; Oliver, 2013), a family member (Zikmund-Fisher et al., 2006; Petrova et al., 2016; Tang et al., 2016; Carroll et al., 2017) or a stranger (Batteux et al., unpublished). This has been interpreted as surrogates being more cautious when deciding for someone else (Oliver, 2013), as well as stemming from the need to justify one's decisions (Zikmund-Fisher et al., 2006), in which case maximizing survival chances is easier to defend. It has also been shown that this reduction in risk-taking is apparent even when it goes against the recipient's preferences (Petrova et al., 2016). Overall, it seems that this effect occurs regardless of the identity of both the decision-maker and the recipient. Even though professional accountability is not relevant in the case of ordinary decision-makers, it is plausible that some other form of accountability is responsible for the reduction in risk-taking, such as the responsibility the decision-maker has toward the recipient and their family to make a well-founded decision. In fact, similar accounts have been put forward when discussing the discrepancies between our own choices and our advice to others – we are more cautious when advising others to avoid being responsible for their loss (Dana and Cain, 2015). Our aim here is to explore the role accountability plays when ordinary decision-makers make surrogate treatment choices.

Past research has often focused on scenarios that speak of the possibility of the patient dying, either without treatment (Zikmund-Fisher et al., 2006; Ubel et al., 2011; Garcia-Retamero and Galesic, 2012b; Oliver, 2013; Tang et al., 2016) or as a consequence of treatment (Ubel et al., 2011; Carroll et al., 2017; Batteux et al., unpublished). Crucially, in all of these cases surrogate decisions were directed toward the option that reduced the patient's likelihood of dying. Wanting to preserve the patient's life and give them a chance is clearly apparent in qualitative reports by surrogates (Schenker et al., 2012; Dionne-Odom et al., 2015; Fetherstonhaugh et al., 2017). This often constitutes the reason why surrogates have such a difficult time deciding and might be prevented from acting in accordance with the recipient's values. We therefore hypothesize that self-other differences are driven by the wish to increase the patient's likelihood of survival, over and above other potential costs (such as diminished quality of life). For that reason, we expect that accountability pushes surrogates toward making a decision that preserves the patient's life.

The predictions made regarding accountability are supported by current theories of surrogate decision-making. Tunney and Ziegler's (2015) model proposes that surrogate decisions are the result of perspective taking that varies according to the features of the decision. In the context of medical decisions, a next-of-kin might engage in a simulated perspective, thereby making the decision the patient would have wanted (i.e., follow the substituted judgment standard), whereas a doctor might adopt a more benevolent perspective and make a decision that is in the patient's best interest (i.e., follow the best-interests standard).

On the other hand, the accountability held against the decision-maker is likely to also make them engage in an egocentric perspective where they consider what is best for themselves, which might prevent them from making a simulated or a benevolent decision. Medical professionals might do this if they fear the professional or legal consequences of making the wrong decision, in which case it would be easier for them to justify a decision that is aimed at saving lives. Ordinary decision-makers might adopt an egocentric perspective if they fear going against the family's wishes, even if that might mean overriding what the patient would want. This coincides with qualitative reports which show that surrogate decision-makers struggle to reconcile the family's wishes with what the patient would want (Schenker et al., 2012; Dionne-Odom et al., 2015; Fetherstonhaugh et al., 2017).

Additionally, Social Values Theory (Stone and Allgaier, 2008) proposes that surrogate decisions are made according to the social value placed on taking or avoiding a risk. It has indeed been found that surrogate health and safety decisions are made in line with what people perceive to be a socially acceptable level of risk-taking (Stone et al., 2013). If taking risks in a medical setting is frowned upon, it makes sense that surrogates would want to minimize risk-taking to avoid being blamed for the negative consequences of their decision, and it is even more likely that surrogates take this into account when held accountable for their decision.

In this study, we examined the hypothesis that once we make the accountability for the negative consequences of taking a risk (i.e., death) salient, decision-makers reduce their risk-taking for others relative to themselves. Although the literature discusses findings in this way, this interpretation has not been formally tested with ordinary decision-makers. Specifically, we want to understand whether the self-other differences that have been reported have arisen due to surrogates thinking about their own accountability. We theorized that there might be two different sources of accountability that have an impact on surrogate risk-taking: the recipient's family and the potential legal implications of making a decision that threatens a patient's life. In doing so, we can assess whether the fear of legal repercussions is also relevant to ordinary decision-makers. Given that we expect that the main source of accountability experienced by surrogates relates to the recipient's survival, we focused our accountability manipulation on the eventuality that the decision leads to the death of the recipient.

We tested the impact that accountability salience can have on risk-taking by manipulating the information we presented to participants when making their surrogate decisions. We predict that making these accountability factors more salient to participants will further decrease their risk-taking. To assess self-other differences in choices, we used the QALY (quality-adjusted life years) standard gamble (SG) method commonly used to measure the utility of health states (Whitehead and Ali, 2010). It measures utility under risk for a particular medical condition by presenting a choice between a safe option[2] (staying in that condition) and a risky option (taking a risky treatment which could lead to the death of the patient). We used both relatively minor and severe illnesses to investigate whether accountability salience had the same effect on both.

[2]Although we label this option the "safe" option to distinguish it from the "risky" option in our study, the "safe" option can be thought of as carrying risks as well, which we will address in our discussion.

MATERIALS AND METHODS

Design

A 2 (Recipient) × 2 (Magnitude) × 3 (Accountability) mixed design was used. "Recipient" was a within-subjects factor where participants made decisions for themselves (self) and for another participant (other). "Magnitude" was a within-subjects factor relating to the severity of the health state. "Accountability" was a between-subjects factor which refers to how accountability was made salient to participants (control, family, legal).

Participants

Participants (n = 86) were recruited from the University of Nottingham. Two participants were excluded because they did not understand the task (one misinterpreted the choices and the other repeatedly pressed the wrong keys). The sample size was determined using G*Power 3.1 (Faul et al., 2007). We expected an interaction between recipient and accountability. Given that this is the first study to test the effects of accountability on self-other differences in medical decisions, we could not compute an effect size based on previous research and therefore theorized that we would find a small to medium effect size. A sample size of 84 enables the detection of a small to medium effect size (d = 0.35) with adequate power (>0.80) and an acceptable alpha level (<0.05). The age group ranged from 18 to 34 (M = 20.65, SD = 3.31). There were 21 males and 65 females. Ethical approval was obtained from the University of Nottingham ethics committee.

Choice Task

Participants completed the experiment on a computer using PsychoPy (Peirce, 2007). They were presented with six illness scenarios (three large magnitude scenarios and three small magnitude scenarios, see **Appendix 1**). The order in which they were presented these scenarios was randomized. Each participant completed each scenario twice: once for themselves and once deciding for another unknown participant. The order in which they were presented with each recipient condition was counterbalanced across participants. They were told that the other participant was a student of a similar age and situation to them. Participants were given the choice between a safe option: remaining in a condition (paraplegia, Broca's aphasia, vegetative state, angina, headache, nausea) and a risky option: a treatment with a probability p of a complete recovery and a probability 1 – p of death. The probability p in the risky option was presented in descending order (100, 95, 90, 80, 70, 60, 50, 40, 30, 20, 10, 5, and 0%) until respondents switched from choosing the risky option to the safe option. Instructions and example trials can be found in **Appendix 1**.

Accountability Salience

In the family accountability condition, participants were asked to think about the recipient's family: "In the event of that person's death, their family will be devastated. Consider how the family would feel and think carefully about the consequences your choice would have for them before you make it." In the legal accountability condition, participants were told what the legal consequences of their decision might be: "In the event of that person's death, you will be held legally responsible for it. If you are able to justify your choice, you will not be prosecuted. Think carefully about your choice before you make it." In the control condition, participants were not provided with additional information or instructions. Accountability was only made salient to participants in the other condition, not in the self-condition.

Manipulation Checks

In order to check whether making accountability salient had an effect, all participants were presented with two questions relating to their surrogate choices at the end of the task. One asked whether they thought of the consequences the recipient's death might have for their family, and the other whether they thought of the legal consequences that the recipient's death might have for them. Participants responded on a 5-point Likert scale (1 being "not at all" and 5 being "a great deal").

RESULTS

In line with previous literature, we computed participants' utilities of the medical scenario for each recipient (Whitehead and Ali, 2010). We did so by taking their indifference point between taking the risky option and the safe option. The indifference point is the average of the two probabilities each side of the crossover point from the risky to the safe option. Utilities varied between 0 and 1 where 0 indicates that they always chose the risky option and 1 indicates they always chose the sure option. We then averaged utilities for large magnitude scenarios and small magnitude scenarios to have an overall utility for each condition. The utilities for each recipient and outcome magnitude can be found in **Table 1** by accountability salience condition. We checked whether these utilities were normally distributed and met the criteria to be entered in an analysis of variance (ANOVA). Their distribution can be found in **Appendix 1**.

TABLE 1 | Mean utilities with standard deviations across participants for each recipient and outcome magnitude by accountability salience condition.

	Self		Other	
	Large	Small	Large	Small
Control	0.55 (0.19)	0.76 (0.17)	0.67 (0.19)	0.78 (0.17)
Family	0.46 (0.20)	0.73 (0.17)	0.63 (0.18)	0.78 (0.17)
Legal	0.47 (0.21)	0.70 (0.19)	0.62 (0.19)	0.76 (0.16)

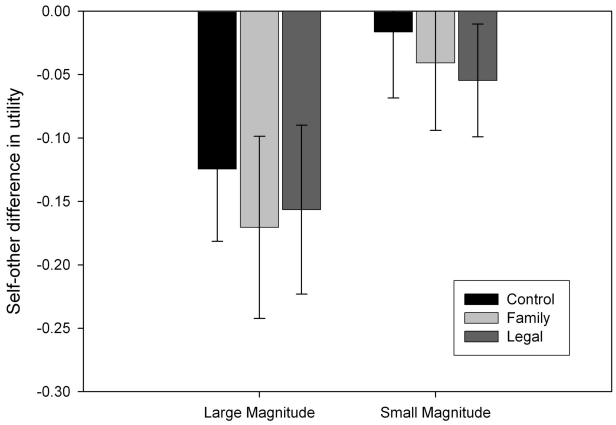

FIGURE 1 | Self-other differences for each outcome magnitude per condition, with error bars indicating 95% confidence intervals. Negative values indicate that participants took more risk for themselves than for someone else.

We entered these utilities in a 2 (Recipient) × 2 (Magnitude) × 3 (Accountability) mixed model ANOVA where recipient (self, other) and outcome magnitude (large, small) were within-subject factors and accountability (control, family, legal) was a between-subject factor. There was a main effect of recipient: participants were more risk-averse for someone else than for themselves ($F_{1,81}$ = 41.90, MSE = 0.02, $p < 0.001$, η_p^2 = 0.341). There was a main effect of magnitude: participants were more risk-averse for small than for large magnitudes ($F_{1,81}$ = 149.95, MSE = 0.02, $p < 0.001$, η_p^2 = 0.649). There was also an interaction between recipient and magnitude ($F_{1,81}$ = 52.731, MSE = 0.01, $p < 0.001$, η_p^2 = 0.405): self-other differences were greater with large magnitudes (mean difference = –0.150, $p < 0.001$) than with small magnitudes (mean difference = –0.037, p = 0.010) according to a simple effects analysis. However, there were no interactions with accountability salience. **Figure 1** shows the self-other difference for each outcome magnitude per condition.

To check for any order effects relating to the recipient condition, we ran the analysis again with the order factor (self-other, other-self). The above results remained the same, with the addition of an interaction between recipient and order ($F_{1,78}$ = 8.385, MSE = 0.017, p = 0.005, η_p^2 = 0.097). According to a simple effects analysis, self-other differences were larger when the self-condition was completed first (mean difference = –0.133, $p < 0.001$) rather than the other condition completed first (mean difference = –0.052, p = 0.011). This reinforces the need for conditions to be counterbalanced to control for order effects.

To further investigate the null effect of accountability salience, we conducted a Bayesian mixed model ANOVA. We did not find evidence for an effect of accountability salience. Full details of these results can be found in **Appendix 1**.

The manipulation checks showed that participants in each condition thought about different factors when making the surrogate decision (see **Figure 2**). Participants' responses were entered in a 2 (Factor) × 3 (Accountability) mixed model

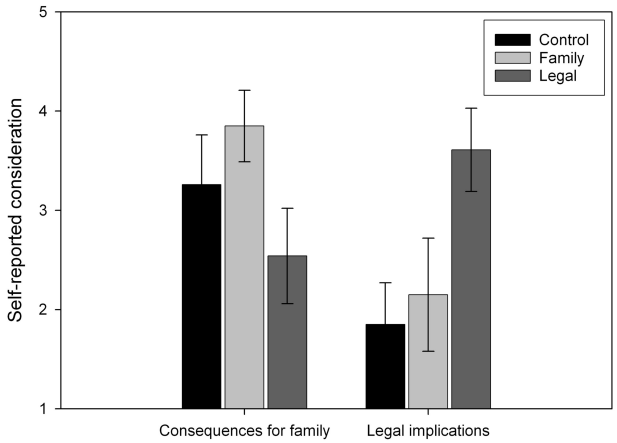

FIGURE 2 | Participants' reports of how much they thought about the recipient's family and legal consequences while making a surrogate choice. Higher values indicate that participants thought about a particular factor to a greater extent. Error bars represent 95% confidence intervals.

ANOVA. There was a main effect of factor: participants reported thinking more about the recipient's family than about legal consequences ($F_{1,79}$ = 13.99, MSE = 1.35, $p < 0.001$, η_p^2 = 0.150). There was also an interaction between factor and accountability condition ($F_{1,79}$ = 23.706, MSE = 1.35, $p < 0.001$, η_p^2 = 0.375). According to simple effects analyses, participants in the control condition thought more about the recipient's family than legal consequences (mean difference = 1.407, $p < 0.001$), as did participants in the family condition (mean difference = 1.704, $p < 0.001$). Participants in the legal condition, however, thought more about legal consequences than the recipient's family (mean difference = 1.071, $p = 0.004$).

We investigated whether there was a relationship between self-other differences overall and self-reports of the extent to which participants thought about a particular factor using Pearson's correlations. There was no relationship between the family factor and self-other differences (r = 0.014, p = 0.903), which would make sense if people were also thinking about their families when deciding for themselves. On the other hand, there was a positive relationship between the legal factor and self-other differences (r = 0.248, p = 0.025), which again would make sense given that legal responsibilities would not apply when making decisions for oneself. It seems that thinking about legal consequences decreases risk-taking for other relative to the self.

DISCUSSION

Surrogates were less willing to accept a treatment that carried a risk of dying for another person as they did for themselves. This is consistent with the literature which has found that surrogates are more likely to make choices that avoid a risk of death for others than for themselves (Zikmund-Fisher et al., 2006; Ubel et al., 2011; Garcia-Retamero and Galesic, 2012a; Oliver, 2013; Petrova et al., 2016). These findings support accounts of self-other differences based on caution due to the responsibility placed on the decision-maker, but also given the uncertainty contained in deciding in the absence of knowledge of the recipient's preferences in our study. Notably, we found that self-other differences held across both magnitudes, meaning that decision-makers reduced their risk-taking for others both when considering minor and severe illness scenarios.

Our findings suggest that the accountability manipulation did not significantly affect surrogate's propensity to accept the risky treatment, even though the manipulation checks show that it did have an effect on participants' thought process. It seems that in the family condition, participants' attention was guided toward thinking about a factor that those in the control condition considered anyway, but that participants in the legal condition were steered away from it and toward a different factor. Our assumption here was that by emphasizing to participants the factors that we expect drive self-other differences, this would further decrease surrogate risk-taking. Our prediction was not supported in our main analysis, although we do observe a trend which indicates that it might have been detected as a small effect in a higher powered study. We also found tentative evidence which does not exclude the possibility that accountability influences self-other differences. The more participants reported thinking about legal consequences, the more likely they were to reduce their risk-taking for the recipient relative to themselves. However, participants in both the control and family condition do not seem to take legal consequences into much consideration, meaning that self-other differences in those groups cannot be explained by that. On the other hand, they both report taking the recipient's family into consideration. The fact that participants in the control group spontaneously thought about the family factor suggests that it could be responsible for the reduction in risk-taking observed in the literature that is not specific to doctors, rather than any legal consequences.

Interestingly, we found a discrepancy between the thoughts our participants and doctors spontaneously report, even though in both cases thinking about legal repercussions seems to reduce risk-taking (Garcia-Retamero and Galesic, 2012b). Contrary to the case of doctors, our participants did not seem to take the legal consequences into much consideration, which makes sense given the strong professional responsibilities that affect doctors. However, we still find similar self-other differences, which suggests that multiple factors lead to a reduction in risk-taking. This could be indicative of a strong norm for taking less risk for others in a medical context and lends support to the idea that these decisions are made according to the social value placed on risk-taking (Stone and Allgaier, 2008). Moreover, if accountability drives these self-other differences, it is conceivable that it is in fact the social norm which is steering the effect of accountability. Given that we define accountability as the need to justify one's decisions to others, it would make sense to rely on a social norm to do so. In the case of doctors for example, they might rely on the social norm

that they are expected to save lives. The influence of social norms on the effect of accountability on self-other differences is an interesting empirical question which remains open to investigation.

It is important to note that we conceptualized risk-taking in this study as the option that carries the risk of the recipient dying. However, refusing treatment is also an option that carries a risk – i.e., remaining ill might lead to harm further down the line. Although the scenarios specifically laid out the symptoms and living conditions associated with the illness, it is conceivable that participants also considered the safer option to be risky. Relatedly, this could mean that they would also feel accountable for not taking the treatment and leaving the recipient with the illness. The fact that risk presents itself in both the safe and risky options, favoring the safe option might simply mean that participants are avoiding the risk of dying, rather than being risk-averse. Considering that participants chose the status quo (i.e., the safe option) for someone else more often than for themselves, this shows further support for our hypothesis that surrogates favor the option that maximizes the recipient's survival regardless of whether this entails taking or avoiding treatment. This is consistent with previous research that shows that doctors are more likely to take a treatment with a higher risk of death but a lower risk of complications for themselves than they are for a patient (Ubel et al., 2011). In light of this, self-other differences in treatment scenarios could be reinterpreted as surrogates being more likely to favor life preservation for others, at the expense of their quality of life, than they are for themselves. In that case, decisions might not be consistently less risk-taking for others, but instead seek the option that prevents the risk of the recipient dying.

Relatedly, by making the treatment option the risky option and the status quo the safe option, we introduced a confound. Perhaps participants were more likely to choose the status quo for others rather than more likely to choose the safer option, out of fear of being accountable for interfering with the natural course of events for example. However, studies that made the treatment option the safe option and the status quo the risky option also found that participants favored the safe option for others (Zikmund-Fisher et al., 2006; Ubel et al., 2011; Petrova et al., 2016; Tang et al., 2016). This sheds light on the confound in the present study and suggests that the explanation we propose holds for cases where the risky option is either taking or refusing treatment. Furthermore, it is possible that the design of our experiment encouraged risk-seeking behavior by making the treatment option the default option (which starts out as being a safe option with no risk of death)[3]. Indeed, the default literature would predict that people are more likely to stick to the default option (Johnson and Goldstein, 2003). This should not have impacted self-other differences unless decision-makers are less likely to stick to the default option for others, which is an interesting question for the wider decision-making literature. Finally, future studies should keep in mind that it might be more ecologically valid to have the status quo as the default option as opposed to the treatment.

[3]We included this trial to check that participants were paying attention and responding honestly, under the assumption that they would take a treatment which lead to a full recovery. Note that participants always selected that option so we did not exclude any on that basis.

Avenues for Future Research

Crucially, what we did not measure here was the participants' feelings of accountability, both in terms of their own guilt and responsibility and their fear of the potential repercussions for them. It is conceivable that it is the emotional response to thinking about these factors that drives the reduction in surrogate risk-taking, rather than the mere fact that participants consider them. Perhaps most participants would think about these factors, but not all would be swayed by them when making their decision. Moreover, making accountability salient did not alter the specific scenarios but rather pushed participants to think about their accountability as the decision-maker. Perhaps a more effective way of testing the effect of accountability would be to compare scenarios that include elements that specifically increase the accountability held against the decision-maker (e.g., the decision-maker is convicted if the recipient dies) or decrease it (e.g., the decision-maker is guaranteed anonymity). Finding more sophisticated ways of assessing accountability is an important step for future research to understand its role.

Investigating an unknown other as the recipient allows investigation of cases where the surrogate has to decide in the absence of information about the recipient's wishes. Nevertheless, it would be worth investigating whether the thought process changes when the surrogate is aware of the patient's wishes. Perhaps feelings of accountability diminish when the patient's wishes are clear and respected by the surrogate. Given that the surrogate would not know the wishes of the recipient's family either, it remains open to question whether they conceptualized the wishes of the family to be different to what we emphasized to them in the scenarios. It would be interesting to investigate whether surrogates would hold different assumptions concerning the wishes of a patient's family.

CONCLUSION

We found that participants were more likely to refuse a treatment that carries a risk of death for someone else than for themselves, therefore implying that they would rather leave them ill than risk their death. It is conceivable that previous findings can be reinterpreted as surrogates favoring saving lives for others more so than for themselves, rather than necessarily taking more risks for themselves than for others. We explored the idea that this was due to participants being driven by the thought of being held accountable in the event of the recipient's death. Our findings show tentative evidence that thinking about accountability steers surrogates away from risking the recipient's life, but further research is necessary. However, we did find that participants considered the repercussions for the recipient's family, and at times legal repercussions when making a surrogate decision. This suggests that participants are considering multiple factors, although it is still unclear how they affect the decisions they make.

These findings can speak to the reality of surrogate decision-making, which often involves a struggle to reconcile the patient's wishes with a multitude of other perspectives and responsibilities (Schenker et al., 2012; Dionne-Odom et al., 2015; Fetherstonhaugh et al., 2017). This supports the idea that a surrogate decision involves a lot more than fulfilling the substituted judgment standard. Asking surrogates to put themselves and the recipient's family aside appears to be an unrealistic expectation.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of The British Psychological Society Code of Conduct with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the University of Nottingham, School of Psychology Ethics Committee.

DATA AVAILABILITY

We have made the data publicly available on https://osf.io/nckxw/.

AUTHOR CONTRIBUTIONS

EB conducted the data collection and analysis, and wrote the first draft of the paper. RT and EF supervised the study.

FUNDING

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00079/full#supplementary-material

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix 1: Medical scenarios[1]

Large magnitude

Paraplegia: Imagine you suddenly develop paraplegia. You suffer from a complete loss of sensation and movement from the waist down, meaning that your legs are paralysed. You are wheelchair-bound and you lose control of your bladder and your bowel. You require some assistance with self-care. Without treatment, there is no chance of recovery.

Broca's Aphasia: Imagine that you suddenly develop Broca's aphasia (a type of stroke). You will have a very difficult time speaking and writing. Nobody can understand you except for maybe the one or two people closest to you. This is very frustrating because you can understand other people but they don't understand you. You can speak a little but you have to work hard at it and most of the words you say will not make sense. Without treatment, there is no chance of recovery.

Vegetative State: Imagine you are the victim of an accident which leaves you in a vegetative state. You are bed-bound and need to be fed through a tube. You have almost lost all consciousness. You are unable to see, speak, and can barely think. You can hear and understand some of the things that are going on around you. You can slightly move your fingers meaning that you can occasionally communicate. There is no pain with this condition and without treatment, there is no chance of recovery.

Small magnitude

Angina: Imagine that you suddenly develop an angina. You have pain or discomfort in mainly in your chest but also in your upper body. You suffer from fatigue and occasional

1 The scenarios presented are worded as in the *self* condition. In the *other* condition, it was made clear that the other was another participant and all pronouns were changed accordingly.

dizziness. You find breathing more difficult than usual. You can take medication to alleviate the symptoms but these are persistent and without treatment, there is no chance of recovery.

Headache: Imagine that you suddenly develop a persistent headache. You suffer from an aching head pain and a sensation of tightness or pressure across your forehead. You struggle to concentrate and the pain can render you unable to take part in your daily activities. Medication does not entirely relieve the pain and without treatment, there is no chance of recovery.

Nausea: Imagine that you develop an illness with symptoms of nausea. You often feel discomfort in your stomach and you are occasionally sick. This makes it more difficult for you to eat and get on with your day. You may be unable to work if the discomfort is too high. You can take medication to reduce the symptoms and without treatment, there is no chance of recovery.

Appendix 2: Instructions and example trial

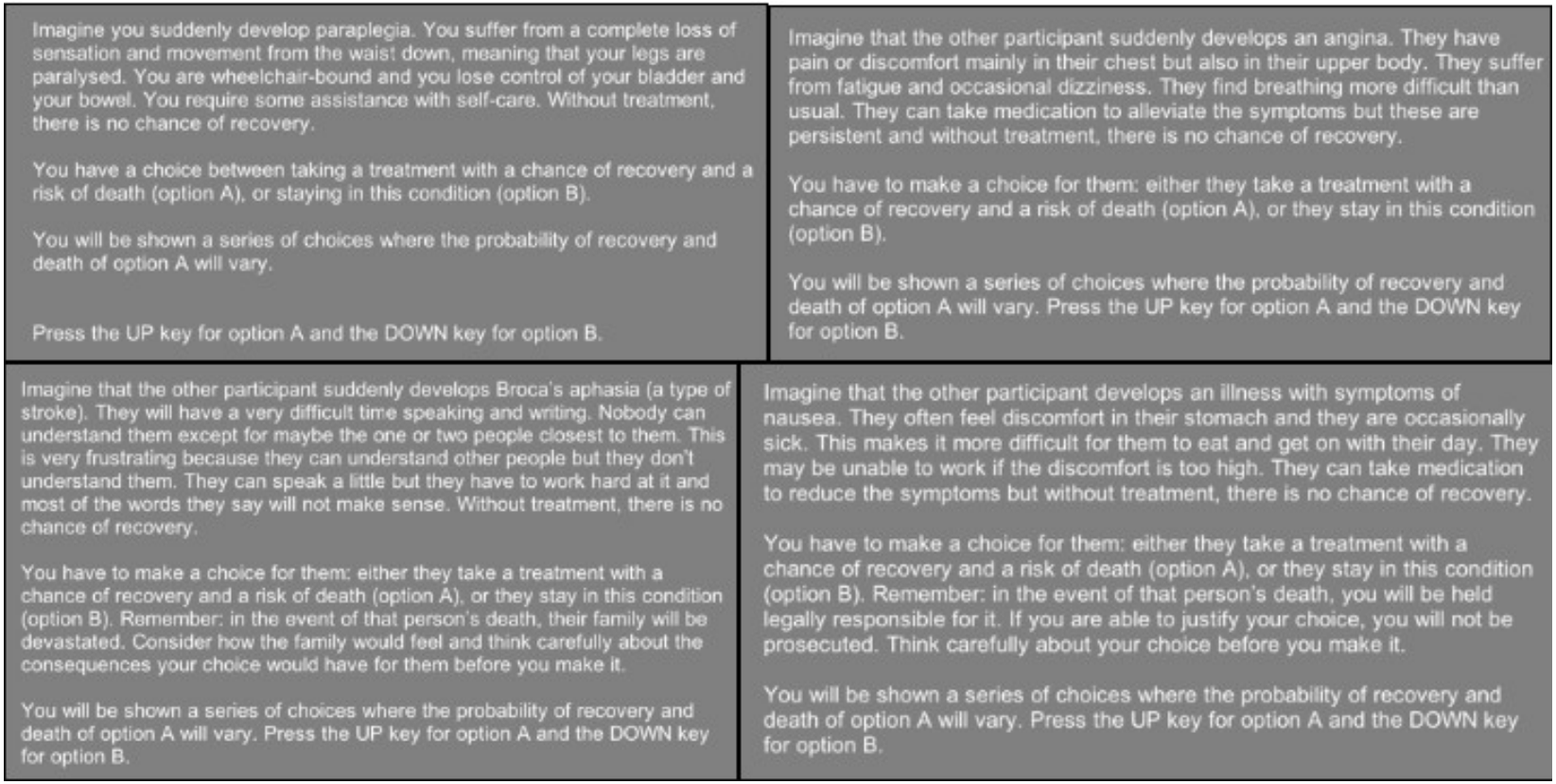

Figure 3: Instructions shown to participants for each accountability manipulation (self, other control, other family, other legal).

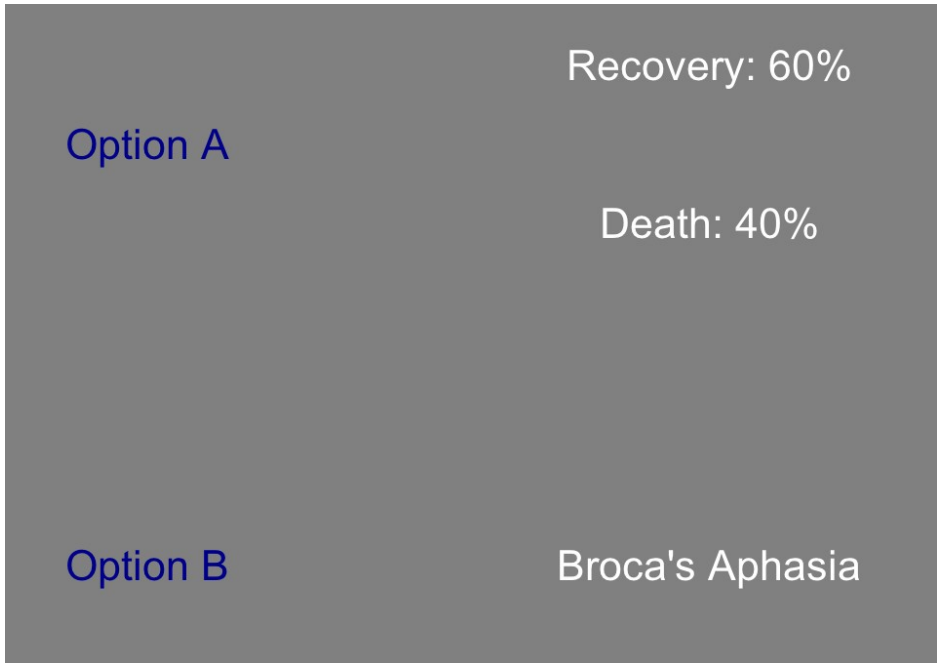

Figure 4: Example trial for the Broca’s aphasia scenario.

Appendix 3: Distributions of each recipient and magnitude across accountability manipulations

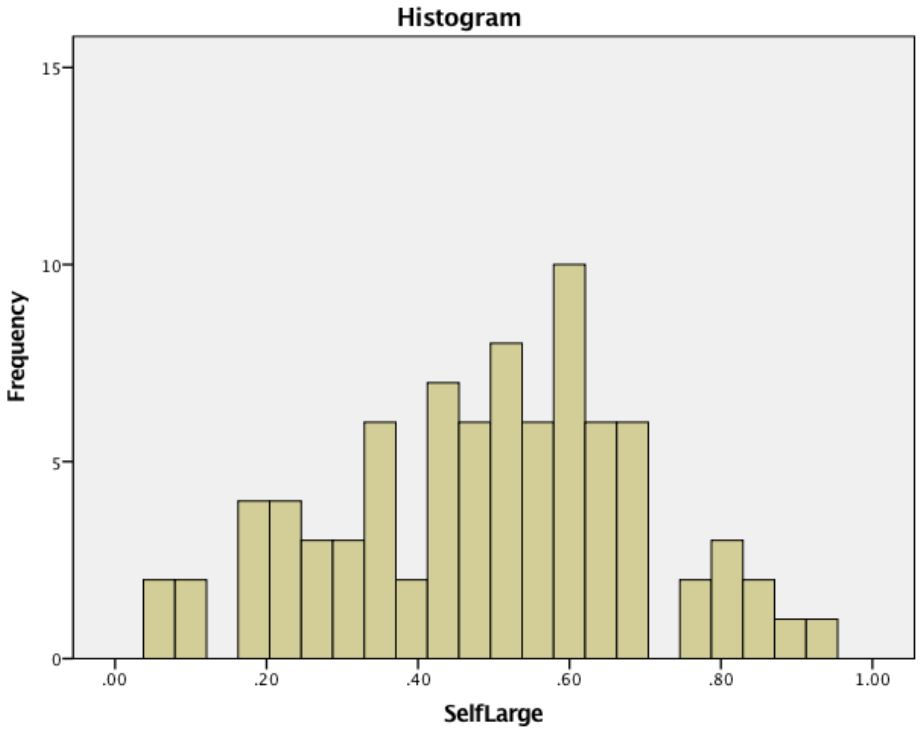

Figure 5: Distribution of utilities for self for large magnitude.

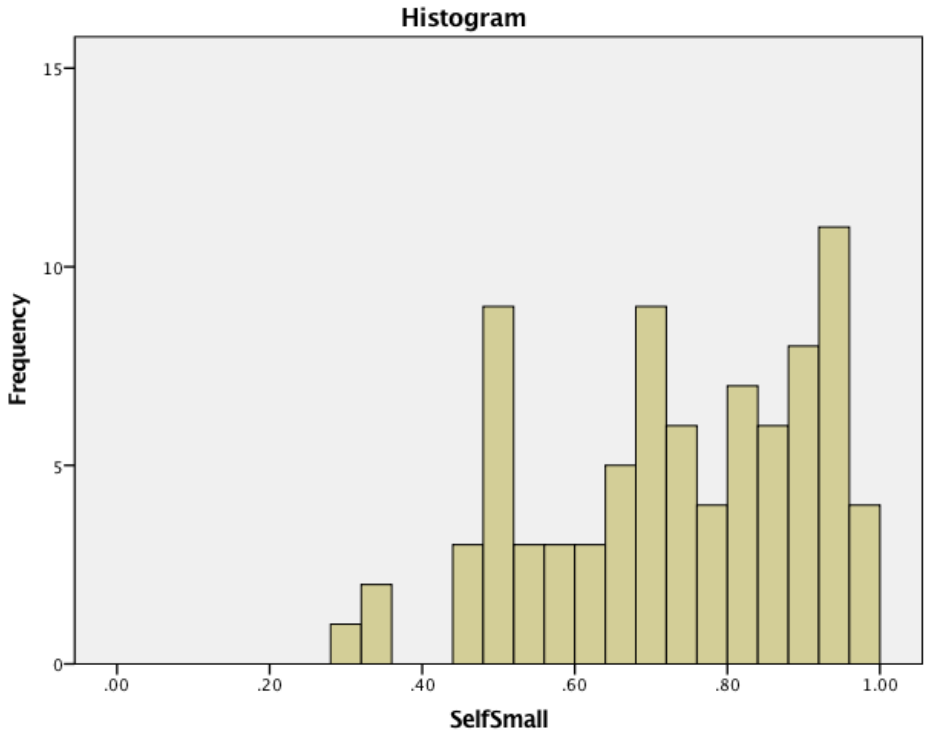

Figure 6: Distribution of utilities for self for small magnitude.

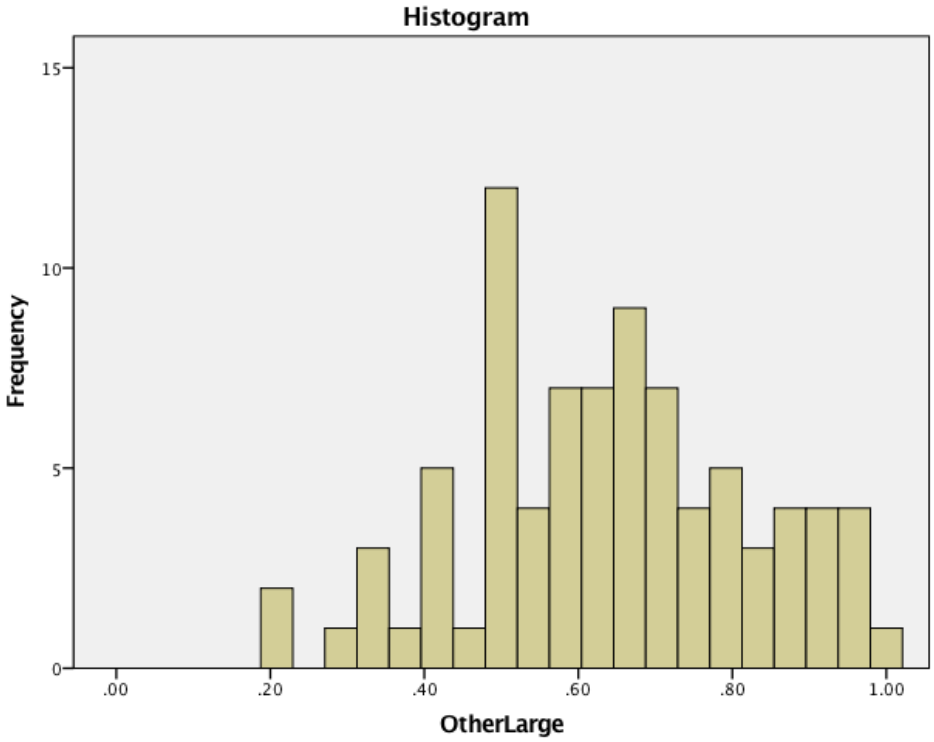

Figure 7: Distribution of utilities for other for large magnitude.

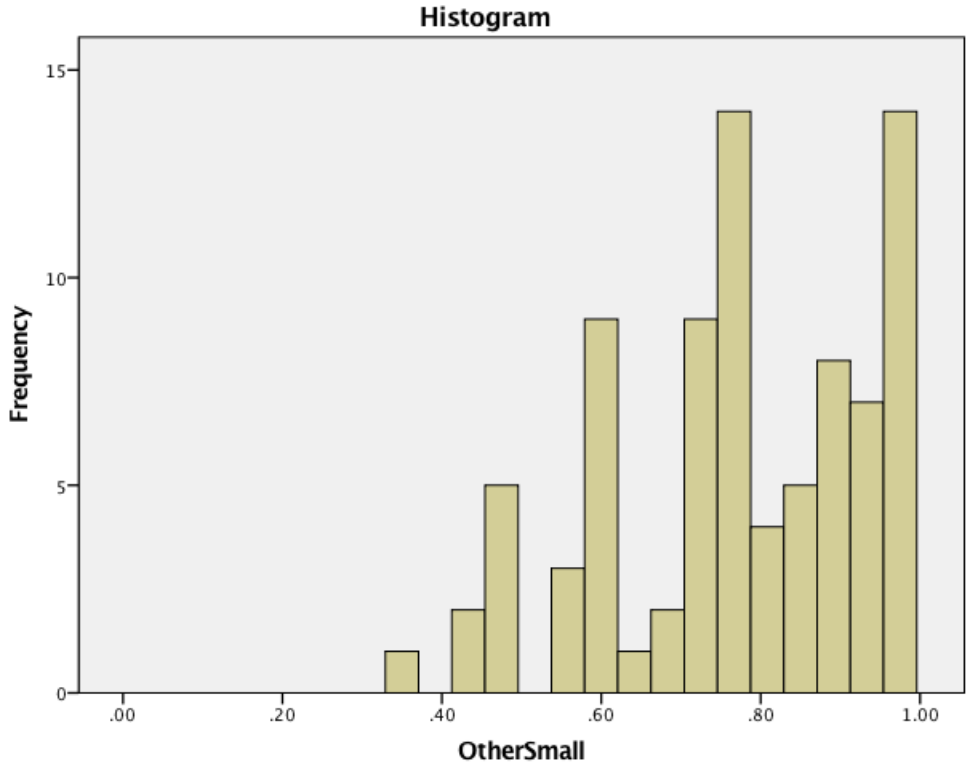

Figure 8: Distribution of utilities for self for small magnitude.

Appendix 4: Bayesian analysis of effects

Effects	$BF_{Inclusion}$
Recipient	$1.358*10^{11}$
Magnitude	$3.217*10^{15}$
Accountability	0.135
Recipient*Magnitude	2194.166
Recipient* Accountability	0.074
Magnitude* Accountability	0.087
Recipient*Magnitude* Accountability	0.009

Paper 5

A mixed methods investigation of end-of-life surrogate decisions among older adults

Under review in *BMC Palliative Care*

A mixed methods investigation of end-of-life surrogate decisions among older adults

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Abstract

Background: A large number of end-of-life decisions are made by a next-of-kin for a patient who has lost their decision-making capacity. This has given rise to investigations into how surrogates make these decisions. The experimental perspective has focused on examining how the decisions we make for others differ from our own, whereas the qualitative perspective has explored surrogate insights into making these decisions.

Methods: We conducted a mixed methods study to bring these two perspectives together. This is crucial to comparing decision outcomes to the decision process. We asked older adult partners to make end-of-life decisions for each other. They then took part in a semi-structured interview about their decision process. Transcripts were analysed using thematic analysis.

Results: 24 participants took part in the study. Surrogates were more likely to take a life-saving treatment at the risk of a diminished quality of life for their partner than for themselves. This was consistent with their transcripts which showed that they wanted to give their partner a better chance of living. Although there was evidence of surrogate inaccuracy in the decision task, participants overwhelmingly reported their intention to make a decision which aligns with the substituted judgment standard. However, uncertainty about their wishes pushed them to consider other factors.

Conclusions: Taking a mixed methods approach allowed us to make novel comparisons between decision outcome and process. We found that the intentions of surrogates broadly align with the expectations of the substituted judgment standard and that previous discussions with their partner helps them to make a decision.

Keywords: surrogate decision-making; self-other differences; end-of-life; substituted judgment standard; mixed methods

Background

In the event that a patient has lost their decision-making capacity due to illness or injury, it is common for a next-of-kin to take on the role of a surrogate to make medical decisions on their behalf. In the US, at least 70% of intensive care unit (ICU) deaths are the result of decisions to withhold or withdraw life-sustaining treatment, but only about 5% of patients are able to make these decisions for themselves (Radwany et al., 2009). If the patient has not written an advance directive, it is usually the case that the next-of-kin will act as a surrogate. Given the increase in age-related illnesses in westernised countries, the need for surrogates is growing (Tunney & Ziegler, 2015).

The ethical framework of surrogate decision-making was developed almost three decades ago and remains representative of the current legislation in many western countries[1] (Buchanan & Brock, 1990). If an advance directive is available, it should be followed. Otherwise, the substituted judgment standard should be applied, whereby the surrogate must decide based on their knowledge of the patient's preferences – i.e. make the decision that the patient would have wanted. When little is known about the patient's preferences, the best interests standard applies whereby the option which provides the best possible outcome is chosen.

The substituted judgment standard assumes that surrogates can accurately predict patients' preferences and that they are willing to decide based on these predictions. However, concerns have been raised regarding its validity. Firstly, surrogates report distressing experiences due to the difficulty in making a decision that they are comfortable with whilst respecting the patient's wishes (Schenker et al., 2012). Patients themselves report they would

[1] The specific legislation regarding the conditions under which surrogate decision-making occurs and the procedure it follows varies from country to country, although similar ethical principles are applied in westernised countries.

like family members and physicians to have input in the decision process, rather than it being solely based on their preferences (Torke, Alexander, & Lantos, 2008). Secondly, the assumption that surrogates can accurately predict patients' wishes has been heavily questioned. A systematic review found that surrogates can predict their next-of-kin's treatment preferences around 68% of the time (Shalowitz, Garrett-Mayer, & Wendler, 2006). Moreover, it seems that surrogates are biased towards predicting that patients would want to be treated, making them more accurate in cases where patients are favourable to treatment (Frey, Hertwig, & Herzog, 2014). Finally, even if surrogates had full knowledge of the patient's preferences, do they decide according to them? In this paper, we aim to further our understanding of how surrogates make these decisions.

How do surrogates make decisions?

There have been qualitative investigations of surrogates' experience of making these decisions after they have taken place (Dionne-Odom, Willis, Bakitas, Crandall, & Grace, 2015; Fetherstonhaugh, McAuliffe, Bauer, & Shanley, 2017; Fritch, Petronio, Helft, & Torke, 2013; Schenker et al., 2012; Vig, Taylor, Starks, Hopley, & Fryer-Edwards, 2006). These show that surrogates do consider the patient's wishes, either by recalling previous conversations or based on their shared experiences. However, they are not the sole focus of their accounts. Other factors come into play which can conflict with the intention of deciding in accordance with the patient's wishes, such as their own values or preserving the patient's life or the family's well-being. Indeed, studies have found that surrogate decisions are often biased towards the decision-maker's own preferences (Fagerlin, Danks, Ditto, & Houts, 2001; Raymark, 2000). Consequently, the substituted judgment standard is not always met.

Parallel to this literature, a strand of experimental research seeks to understand why we might make different medical decisions for ourselves than for others. It has found that we are

more likely to avoid harmful risks for others (Batteux, Ferguson, & Tunney, 2019a). Although a range of medical treatments and illnesses have been investigated, the common denominator seems to be that surrogates are drawn to the option that is most likely to preserve the patient's life (i.e. avoid a risk of death) (Von Gunten & Scherer, 2018). However, for themselves, participants are more likely to accept or decline treatment which might increase their chances of dying to avoid an illness (Carroll, Saha, Ofner, & Downs, 2017) or complications from taking a treatment (Ubel, Angott, & Zikmund-Fisher, 2011).

When doctors or surgeons make decisions for patients, this has been explained in terms of professional accountability (Garcia-Retamero & Galesic, 2012). When people from the general population make decisions for a stranger or family member, the reasons are not clear (Dore, Stone, & Buchanan, 2014; Tang, Shahab, Robb, & Gardner, 2016; Zikmund-Fisher, Sarr, Fagerlin, & Ubel, 2006). Interestingly, discrepancies have been reported between surrogate choices and predictions. Surrogates have been found to avoid a risk of death for someone else more than themselves, despite predicting that they have similar preferences (Batteux, Ferguson, & Tunney, 2019b; Garcia-Retamero & Galesic, 2012; Stone, Choi, de Bruin, & Mandel, 2013). This suggests that surrogates might override the recipient's preferences in order to make a more cautious decision on their behalf to preserve their chances of living.

Psychological theories of surrogate decision-making

Tunney and Ziegler's (2015) model puts forward that surrogates engage in various forms of perspective taking when making a decision. More or less weight is attributed to a particular perspective depending on the features of the decision. In the case of end-of-life decisions – highly significant decisions for which the decision-maker can be held accountable – the theory predicts that surrogates will be drawn towards what is required of them. If surrogates are

expected to follow the substituted judgment standard they will engage in simulated perspective-taking (predicting what the recipient would do), whereas if they are expected to follow the best interests standard they will engage in benevolent perspective-taking (what the recipient should do). A surrogate who is very close to the recipient is expected to take a simulated perspective as they are more likely to believe it will accurately match the recipient's preferences. However, the surrogate might also engage in an egocentric perspective (what the surrogate wants) in order to preserve their own interest. Finally, in cases where the surrogate does not have full knowledge of the recipient's preferences, they might rely on a projected perspective (what the surrogate would do if they were the recipient). Although the model expects a next-of-kin making an end-of-life surrogate decision to attribute more weight to a simulated perspective, other perspectives might come into play which prevents them from strictly adhering to the substituted judgment standard.

A number of theories make specific predictions regarding when and why self-other differences occur. The presence of a *hot-cold empathy gap* between the surrogate and the recipient predicts that decision-makers underestimate the intensity of surrogates' affective state, unlike when making decisions for themselves (Loewenstein, 2005). This would lead surrogates to underappreciate how much the recipient is impacted by a particular health state. Similarly, the *risk-as-feelings hypothesis* predicts self-other differences occur given a reduction in the emotional reaction to the prospect of a risk when deciding for someone else (Loewenstein, Weber, Hsee, & Welch, 2001). Both assume that surrogate decision-making is no different from people's own decision process and that self-other differences will only be a reflection of the psychological distance between the surrogate and the recipient (Trope & Liberman, 2010). Finally, *social values theory* suggests that social values will be the key factor taken into account when making surrogate decisions, more so than when people make their own decisions. Self-other differences are expected to arise when taking a risk is either socially

valued or frowned upon (Stone & Allgaier, 2008). None of these accounts are able to capture the intricacies of making surrogate decisions in end-of-life scenarios, which is likely to be a much more complex and reflective process. In this respect, Tunney and Ziegler's model (2015), in assuming that surrogates engage in perspective-taking, is far more able to support an understanding of how surrogates navigate such complex medical decisions. It can conceptualise the tensions felt by surrogates between their own perspective and the need to abide by the substituted judgment standard. It is therefore well suited to guide an analysis of surrogate decisions.

The present research

So far, quantitative studies have looked at self-other differences in treatment scenarios, whereas qualitative studies have focused on the experiences of surrogate decision-makers without taking into account the specific clinical content of decisions made. We do not yet know much about end-of-life scenarios other than qualitative reports taken place after the decisions were made. There is therefore scope for research that can bridge the gap between the decisions that surrogates make and the reasons they give for doing so. In the present study, we investigate how older adults make end-of-life treatment decisions for their partners via a decision-making task and a semi-structured interview. By taking a mixed methods approach, we position ourselves within a pragmatist epistemological framework whereby we accept that qualitative and quantitative methodologies can hold conflicting ontological and epistemological assumptions, but put these to one side in our analysis to focus on addressing the research question and its real world implications(Feilzer, 2010).

We used an expansion design where we mixed methods to extend the scope of inquiry to different inquiry components (Greene, Caracelli, & Graham, 1989), namely the outcome of the decision (quantitative method) and the process of the decision (qualitative method). Our

quantitative research question was: are people more willing to accept a life-saving risky treatment for themselves than for their long-term partner? Given previous findings, we expected participants to accept more treatment for their partner, even if that means risking their quality of life. Our qualitative research question was: which perspectives do surrogates take when making end-of-life decisions for their partners? We conducted in-depth semi-structured interviews which we analysed using a thematic analysis. We recruited older adult partners as they are more likely to make these sorts of decisions for each other in the near future. We could then compare participants' own decisions to the ones their partner made for them to assess whether any inaccuracy is related to failing to take a simulated perspective (i.e. decide according to what their partner would want). We integrate results from both methods in our discussion.

Method

Participants. We recruited older adult partners (60-80) in long-term relationships from Nottinghamshire, UK. Recruitment methods included the School of Psychology's community sample, local University of the Third Age (U3A) branches and word of mouth. Participants were either contacted via email or directed to the investigators via email.

We recruited 12 partners (n=24) who were all in heterosexual relationships. Participants took part between April and July 2018. All were able to understand and complete the decision-making task and take part in the interview. Participant characteristics can be found in Table 1. The proportion of participants with children and grandchildren was inferred and collated from comments participants made during their interviews. It could not be exactly defined as 92% (n=22) mentioned children and 67% (n=16) mentioned grandchildren.

Table 1: Participant characteristics

Characteristic	Participants
Age (in years)	Mean=67.67 (59-81)*
Gender	50% female (n=12)
Relationship to partner	
Length (in years)	Mean=41 (10-51)*
Marital status	92% married (n=22)
Children	
Children with partner	75-83% (n=18-20)
Grandchildren from partner	42-75% (n=10-18)
Other children/grandchildren	4% (n=1)

*Values in parentheses refer to the range.

Procedure. Partners were asked to come to the University of Nottingham together. After giving informed consent, they took part in the study in turn, whilst their partner waited in a separate room. Every participant completed the decision-making task first, which was followed by a semi-structured interview. The ethical and medical context in which surrogate decisions are made were not described to participants to avoid biasing their answers. For example, we did not mention the substituted judgment standard at any point. Participants were debriefed together once both had completed the study.

Decision-making task. Participants completed three scenarios adapted from the willingness to accept life-sustaining treatment (WALT; Fried, Bradley & Towle, 2002) instrument (see Supplementary File 1). Each scenario depicted a life-threatening situation in which participants are taken to hospital and offered a high-burden treatment course to recover. The probability of the treatment working varied from 90% to 10% in decrements of 10. In each case, participants had to indicate whether they would want the treatment or not. They were told that without the treatment they would not survive. The outcome of the treatment varied: either

the treatment works and their current health is restored, or it doesn't and they die from the illness (death scenario), end up bedbound (functional impairment scenario) or unaware (cognitive impairment scenario). The functional and cognitive impairment scenarios allow us to examine the risk of impaired quality of life participants are prepared to take to for a chance of living. Every participant completed the scenarios once from their perspective (i.e. making decisions for themselves) and once making decisions on behalf of their partner. The order in which participants completed these was counterbalanced.

Quantitative analysis. To investigate self-other differences, we computed the average between the lowest chance of recovery participants accepted and the highest chance of recovery participants refused: the point at which they were indifferent between accepting and refusing treatment. To assess whether surrogate decisions were accurate, we computed the difference between surrogate decisions and the recipient's decisions by subtracting the latter from the former and removing the sign. This gave us a value representing how far surrogate decisions deviated from the recipient's decisions. We consider a result to be statistically significant at $p<.05$. However, as our sample is small, we will also examine effect sizes which can be more meaningful than p-values.

Semi-structured interviews. Participants took part in in-depth semi-structured interviews conducted by the first author (see Supplementary File 2 for interview guide). The questions were open-ended and designed for participants to freely speak about their experience and thought processes in the decision-making task. The questions were centred around three topics: recall of surrogates' thoughts when making decisions for their partner, further exploration and discussion of their reasoning and experience, and how their surrogates decisions compared to their own decisions. Interviews ranged from 15 to 45 minutes, were audiotaped and transcribed verbatim.

Qualitative analysis. We analysed the interview data using a thematic analysis which allows us to identify and analyse patterns in rich detail.. We were guided by an essentialist/realist epistemological approach which reports experiences, meanings and the reality of participants (Braun & Clarke, 2006). We interpreted participants' motivations and experiences in a straightforward manner, assuming a largely unidirectional relationship between their language and the experiences they report. We took a semantic approach whereby themes were identified within the explicit content and meanings of the data, moving from a description to an interpretation of it. Given our interest in understanding the perspectives participants took when making surrogate decisions, we followed a theoretical thematic analysis driven by the forms of perspective-taking laid out in Tunney and Ziegler's (2015) model. This meant that, although we did not start out with an a priori coding frame, our analysis was driven by our theoretical interest and provided a more detailed account of a particular aspect of the data, rather than a rich description of the entire data set. We directed our analysis towards the decisions participants made for their partner, rather than the ones they made for themselves, as our research question was focused on the surrogate decision process.

We followed the analytical steps as laid out in Braun and Clarke (2006), After transcribing the interviews, the first author (EB), who is trained in thematic analysis, worked through the data set to generate codes using NVivo. EB then went through the dataset again to check that all extracts that were pertinent to our codes had been identified, collating codes if necessary. Once the list of codes had been generated, the coding was checked with a researcher independent to the study (WD) who is trained and experienced in a range of qualitative analysis methods. WD was given half of the transcripts (N=12). WD coded the transcripts independently, which was then compared to EB's coding. EB and WD discussed discrepancies and independently revised their coding, after which the kappa agreement score was 0.98. After this process of triangulation, EB sorted codes into potential themes by considering how

different codes might combine to form an overarching theme. EB read through the data extracts of each candidate theme to ensure that they formed a coherent pattern. Next, EB considered whether the thematic map formed a coherent representation of the entire data set by reading through it again. Finally, EB named and defined each theme in order to form an accompanying narrative.

Results

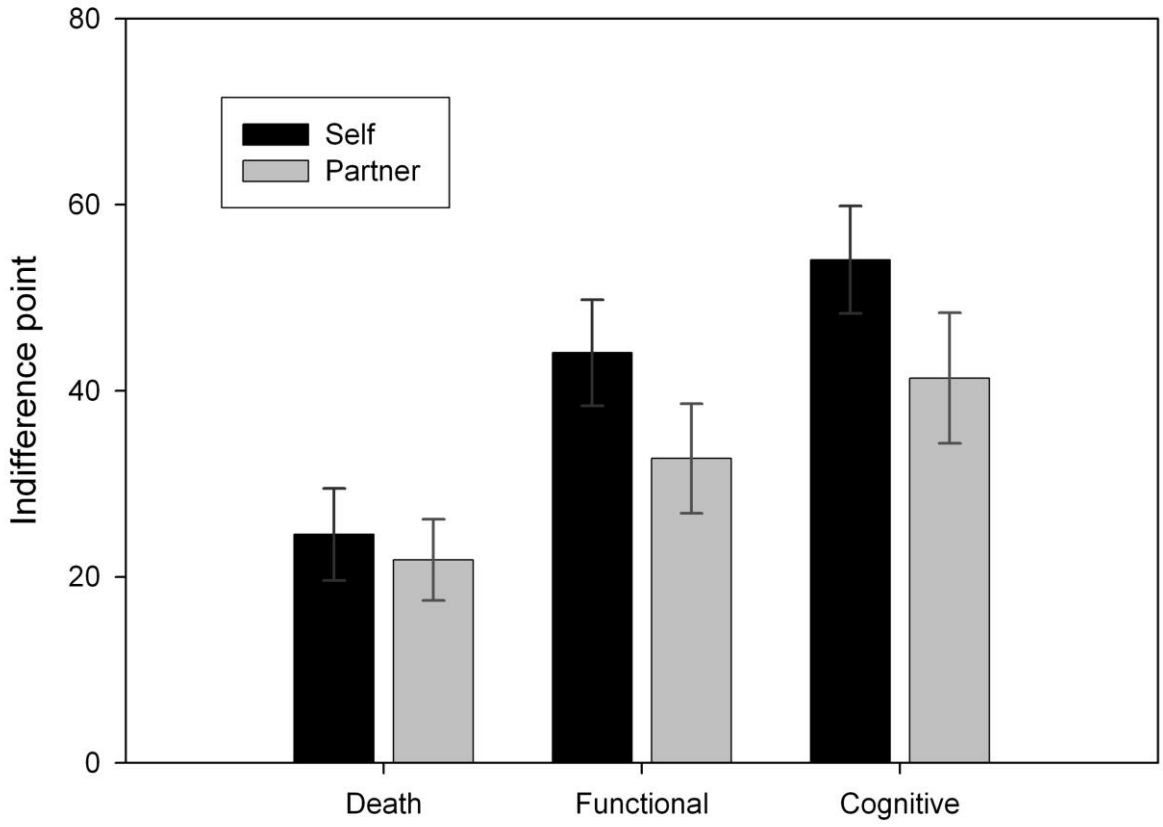
Quantitative findings

Given our small sample size, we took measures to ensure that we could draw meaningful conclusions from our findings. We calculated the effect size we could detect from our sample. With a sample of 18 participants, a large effect size (d>0.80) can be detected with adequate power (>.080) and an acceptable alpha level (<.05) according to G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). We calculated post hoc power for our statistically significant results. Further, a member of one of the dyads had very specific health preferences, which stood in contrast to the rest of our sample. This was reflected in their own choices and the ones their partner made for them, and spoken about at length during both of their interviews. Given that we had a small sample, we decided to exclude this dyad from our quantitative analyses to preserve statistical validity. This did not have an impact on the direction of the results, as can be seen in our analyses with the full sample in Supplementary File 3.

Self-other differences. Participants' indifference points were entered into a 2 (recipient) x 3 (outcome) repeated-measures ANOVA (see Figure 1). The main effect of recipient was significant ($F_{1,21}$=9.751, MS_e=270.455, p=.005, η_p^2=0.317)[2]: a simple effects analysis showed

[2] According to a post hoc power (PHP) analysis, a sample of 22 participants was sufficient to detect an effect size of η_p^2=0.317 with PHP>0.95.

that participants accepted treatment more often for their partner than for themselves (mean difference=-8.939, p=.005). The main effect of outcome was also significant ($F_{2,42}$=22.537, MS_e=299.747, p<.001, η_p^2=0.518) [3]. According to a simple effects analysis, participants were overall more likely to accept treatment in the death scenario than in the functional impairment scenario (mean difference=-15.227, p<.001) and the cognitive impairment scenario (mean difference=-24.545, p<.001). They were also more likely to accept treatment in the functional impairment scenario than in the cognitive impairment scenario (mean difference=-9.318, p=.006). The interaction between recipient and outcome approached significance ($F_{2,42}$=2.725, MS_e=118.723, p=.077, η_p^2=0.115). Surrogates seem to be more willing to accept a treatment for their partner than for themselves, even if it can reduce their quality of life.



[3] According to a post hoc power (PHP) analysis, a sample of 22 participants was sufficient to detect an effect size of η_p^2=0.518 with PHP>0.95.

Figure 1: Participants' indifference points for themselves versus their partner for each treatment outcome. Lower values indicate that participants were willing to accept a treatment with a lower chance of recovery and a higher risk of reduced quality of life. Error bars represent the standard error of the mean.

Surrogate accuracy. We examined whether surrogate accuracy significantly deviated from 0 using one-sample t-tests (see Figure 2). This was the case for death (t_{21}=3.607, p=.002), functional impairment (t_{21}=6.864, p<.001) and cognitive impairment (t_{21}=6.410, p<.001) scenarios. To investigate whether accuracy differed by scenario, we conducted a repeated-measures ANOVA with outcome as a three-level factor. We found a main effect of outcome ($F_{2,42}$=4.596, MS_e=338.600, p=.016, η_p^2=0.180). Pairwise comparisons showed that accuracy in the death scenario was higher than in the functional impairment scenario (mean difference=-14.091, p=.017), as well as higher than in the cognitive impairment scenario (mean difference=-15.000, p=.026). Accuracy between the functional and cognitive impairment scenarios did not differ (p=.854). These results indicate that surrogate decisions were less likely to be accurate when the outcome involved living with a reduced quality of life rather than death.

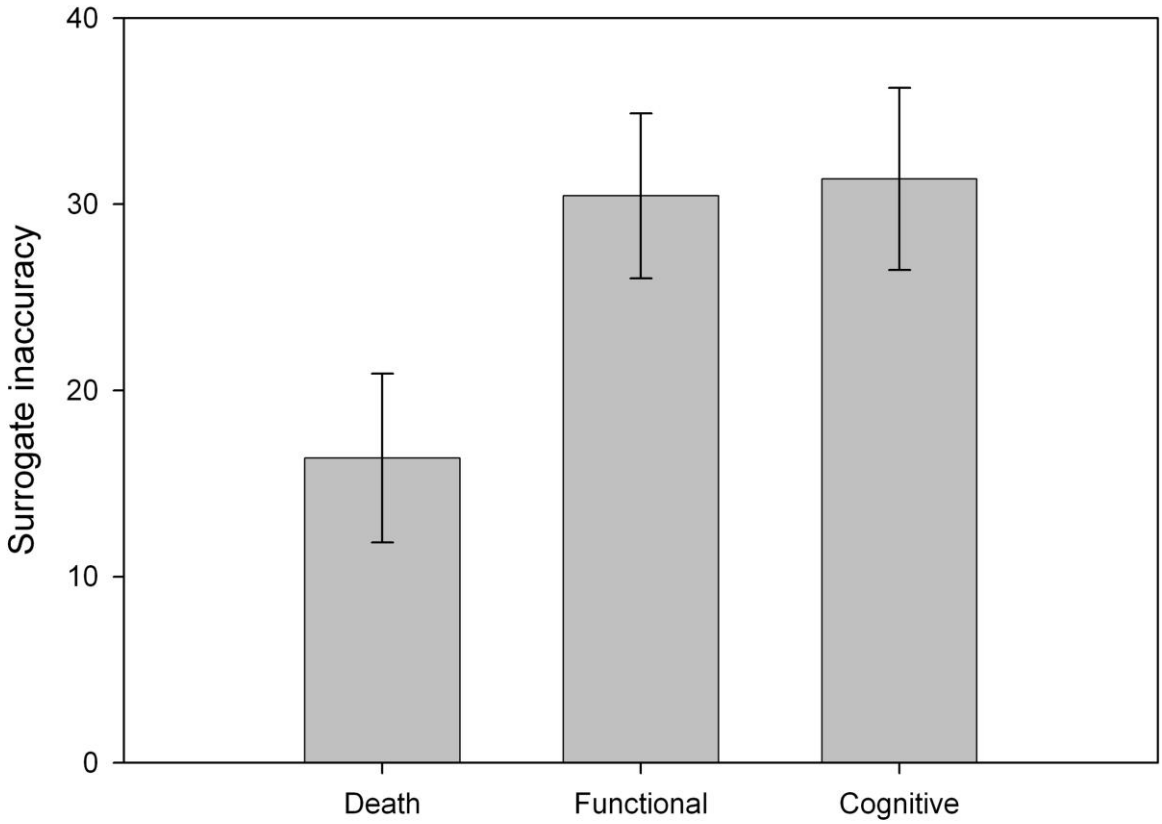


Figure 2: Surrogate inaccuracy represents the deviation in indifference points between surrogate decisions and the recipient's decisions. Error bars represent the standard error of the mean. Higher values indicate that surrogate decisions were less accurate.

Qualitative findings

We identified three themes, each composed of two sub-themes: respecting their partner's wishes (with sub-themes 'beliefs' and 'process'), overcoming the uncertainty (with sub-themes 'drawing from past experiences' and 'reproducing their own decision-making') and balancing perspectives (with sub-themes 'their partner's best interest' and 'thinking about their own interest') (see Figure 3).

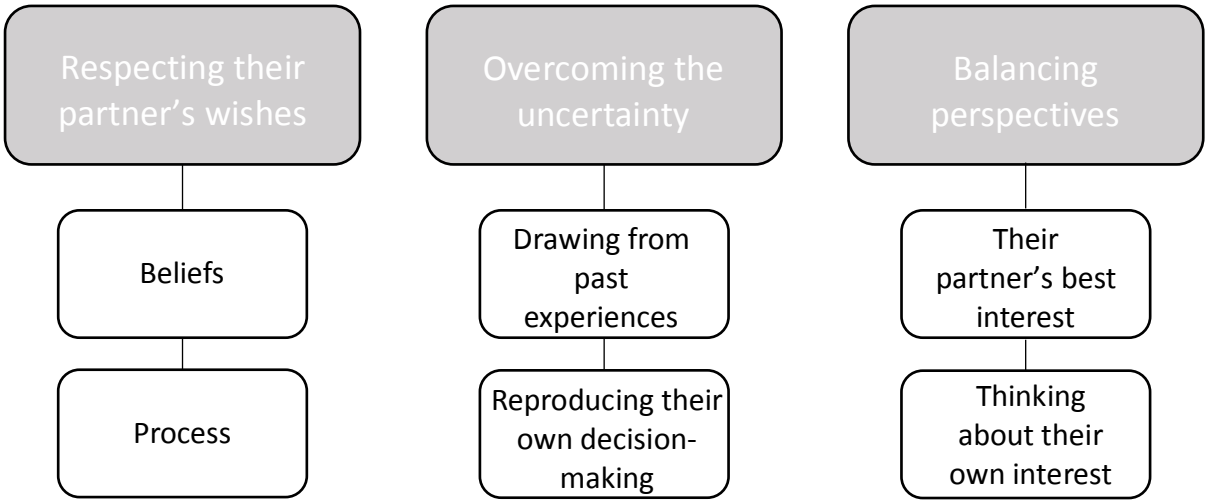


Figure 3: A map of the theme structure generated by our analysis of participants' interviews.

Respecting their partner's wishes

Participants expressed their views that surrogate decisions should be made in line with the patient's wishes. These translated to their decision-making, as surrogates overwhelmingly identified that their decisions were guided by knowledge of their partner's wishes. We split this theme into two components: (a) beliefs and (b) process.

Beliefs

Participants often made it clear that they believe these decisions ought to be made in accordance with the patient's wishes. It was at times explicitly stated about the decisions they made for their partner, but was also expressed in relation to surrogate decision-making in general, suggesting that it is strongly held and internalised: (Male, 68 years) *"You're sort of their representative in the thinking world really, and you do what you think they would want."* Participants often believed the right decision was a decision that their partner would want: (Male, 67 years) *"The wrong decision would be if you've taken an opportunity for them to live in a way they wouldn't want to live, and you've given it to them."*

Participants highlighted that partners should discuss these scenarios so that they are prepared if they happen and are able to make a decision that respects their wishes: (Female. 65 years)*"Well yes I do [think would be the best person to make it], because it's something that we've discussed. […] I do think that people need to talk about these things, and I think there's this big taboo about people talking about this."* Almost all participants stated that they should be the designated surrogate because they know the recipient best.

Thinking that surrogates should know the recipient's wishes highlights the implicit belief that surrogate decisions should be made according to these wishes. A few participants stated that medical professionals should not make these decisions because they do not know the patient well enough: (Male, 70 years) *"If you talk to one another, you know. They know that you've always been active and run up the hills, and done this and cycled, and swam or whatever. And you're still doing it. And there's a 90% chance that you're going to end up paralysed and lying in a bed. There's no way you'd want that. But the doctor might say 'well, you know, I've got to save a life'. […] So you've got to be able to say to the doctor they wouldn't want their life saving."*

Process

Most participants' intention was to make a decision that respected their partner's wishes. This was spontaneously reported by participants and usually constituted their answer to the first question posed to them, namely to walk the interviewer through their thought process. They often explicitly stated that they reflected on what they thought their partner would want in order to make a decision for them: (Male, 69 years) *"I was trying to imagine if it wasn't me making the decision, but it was their independent decision, what they would like to happen. And obviously I would make that decision for them based on those thoughts."* Participants usually

referred to their partner's wishes to justify their decisions. Many spoke at length about what their partner would want in each scenario and based their decisions on this.

Even when participants did not know their partner's wishes on the matter, they sometimes tried to make a judgment based on their wider knowledge of their partner: (Female, 66 years) *"My partner is the type of person who would definitely want to try everything. […] So I just ticked everything, it's as simple as that. I don't know his thoughts on that at all, because he's a man who never talks about anything personal, so I have no idea on his thoughts and ideas of anything like that at all, so I've just had to guess."* This suggests a three-step process to their decision-making: having the intention to decide according to what their partner wants, recalling knowledge of their partner's wishes, and searching for other clues in their partner's thoughts and behaviours that might be indicative of their wishes. For partners who might not discuss their health preferences, they might not be able to recall knowledge of their partner's wishes and have to rely on step 3 to infer what they might want.

In terms of how participants felt towards this process, one participant mentioned they would not feel guilty because they knew they chose what their partner would want, whereas another felt guilty for not doing so. Participants also felt more confident about their decisions when they knew they had taken their partner's wishes into account. This made their decision process easier and made them feel like they made the right decision: (Female, 62 years) *"I'm quite confident that he'd be the same, that he would feel that I'm making the right decisions. […] Because that's how we believe life is, you know. We don't want to survive if we're mentally or physically, you know."* Conversely, when comparing the process of deciding for their partner to the process for themselves, participants often mentioned that it was more difficult for their partner because they were less sure of their partner's wishes than their own: (Male, 70 years) *"What if you got it totally wrong? What if they wouldn't mind being stuck in that bed and they'd take a 10% chance of it working alright? And 90% chance of being stuck in a bed? What*

if they wouldn't mind that but you said 'let them die'. […] I think I'd know for myself at what point I would cut off, I'd say 'no this is enough'. Weighting it all up, the effect on my family, the effect on me, I'd know. But I can't see inside somebody else's head. I can't can I. I can assume I know what they want, even though I've known her a few years. I can't guarantee it."

Overcoming the uncertainty

Participants overwhelmingly expressed the burden that surrogate decisions involve. Despite feeling like they knew their partner's wishes, that there was still a level of uncertainty. One participant spoke of there always being a 'nagging doubt', whereas their own decisions were 'cast-iron'. Participants stressed it was difficult to judge the level of risk their partner would be prepared to take, making the cut-off point challenging to establish: (Male, 70 years) *"The one that was quite challenging was where do you cut off the risk of the treatment not working and leaving somebody stuck in bed but aware? What sort of cut off level? When you've got 20% chance of walking out here fit and well, if we don't treat you you're going to die, if we do treat it there's an 80% chance of you ending up in that bed there, and having it out again. And you're thinking, you know, 1 in 5, is it worth it? 1 in 10, is that worth it? Is it worth trying? That was difficult."* Participants had to resort to other sources of information to guide their decision-making and ease the process: (a) their past experiences and (b) their own decision-making.

Drawing from past experiences

Participants drew from a pool of past experiences they shared with their partner to inform their decision-making, namely life events and discussions concerning illness and end-of-life care. Many spoke of their close relatives or friends who had experienced reduced quality of life and expressed theirs and their partner's strong wish to not find themselves in those states. This seemed to shift their focus towards quality of life when making decisions, rather than the mere

preference for life itself: (Male, 70 years) *"I think if she was very ill, and ended up having her quality of life reduced as such that she couldn't get out the house, or walk, or ride a bike, or do anything, she'd want to die. She'd say 'I've got no life, I've got no quality, I've got nothing'. […] Looking after her father that's 80 something. She's having to go out and sort him out, all the time. […] And she's seen it from that end, and she's seen what it does to other people. So I don't think she'd do it."*

On occasion, participants had been surrogates for family members, which they reported influenced their decisions. A few had worked in the care system and had witnessed patients at the end-of-life and families having to make these decisions. These experiences shaped their outlook on end-of-life care, which made them more aware of these issues and likely to discuss them with their partner, which was identified as guiding their decision-making: (Female, 62 years) *"So many people don't [discuss this]. […] there's a lot of people out there that don't even go there. Don't think about it, the consequences. Until you're in… But I think because we think ahead, so you think that it's easier to make that decision."*

Recalling these discussions reassured them and confirmed that they were making an accurate decision, which eased the decision process: (Female, 64 years)*"We're in a good position because we've talked about it before, so decisions are somewhat easier than if it just came out of the blue and then I'd have to decide."* They anticipated they would give them the courage to make that decision in real life: (Female, 65 years)*"A lot of the decisions that are made are to prolong a person's death, and then they're not given a comfortable death at the end of it, because people are too frightened to take the decisions on their behalf, because they would feel guilty. Whereas it's something that we have discussed, between ourselves and with our children."* However, there were cases where participants had not had these discussions and would not feel up to making these decisions: (Female, 70 years)*"It is like 'do you pull the plug on life support'. No I couldn't. I couldn't. To me it would be like shooting him, stabbing him, I*

can't do that. I couldn't do that to anybody. And that's really hard. Had he told me his thoughts before, then that would be something different."

Reproducing their own decision-making

Many participants reported sharing similar views regarding end-of-life with their partner, meaning they could refer to their own thoughts to inform their judgment about their partner's: (Female, 62 years)*"I know that the reason that I put the same for him as I would for me, is because that's how he would feel in the same way. So we'd both do similar things I think. It's just where the cut off would be"*. Most mentioned that they didn't consider each scenario to be equivalent, both for them or their partner. Their own reasoning for each scenario was therefore applied when making surrogate decisions: (Female, 70 years)*"On the first page, the treatment, you know, it will either work or it won't work. Well yes, you go for everything. If it's there, go for it, there's always a chance. The second one where you would be bedbound, you've still got a life, and I would always be there to look after him, if not there would be other people… We have family. And I think both of us want to see our grandchildren grow up, whatever, so the bedbound bit, yeah, go for it, really. Because it could work, that's the thing, it could work."* Finally, participants' judgment about the risk of the treatment not working (i.e. not leading to a complete recovery) was applied to both their own and surrogate choices. Interestingly, they reported very different judgments about what an acceptable level of risk is, as depicted in Table 2.

Table 2: Judgments about the risk of the treatment not working across participants

High risk (Male, 59 years)	*"10% chance is still a chance, so you've got to take that chance. If you say 90% chance you might be bedbound, well fine we can always get assistance to help you with that. The ultimate thing is, without the treatment, you're gone, so a 10% chance has to be taken really."*

Medium risk (Male, 75 years)	[speaking about the surrogate decisions] *"I think on all the questions I went down to the 50/50, and that would be my final gamble. If it was 50% chance, you might as well take it. Less than 50, I just said no."*
Low risk (Female, 62 years)	*"I think, I sort of, more for the physical, I probably gave, slightly… I mean I think it was only 80/90, sorry 80/90% chance you get a full recovery. But otherwise, no. Because I think then you're getting into the realms that, you know, you're getting the higher risk chance that you are."*

Balancing perspectives

Most participants were also driven by other factors than their partner's wishes, even if they did consider them. This meant that they then had to find the right balance when making their final decision: (Male, 66 years*)"I think it's weighing up the risk, and your wishes and your partner's wishes."* Having to balance these different perspectives implied that they thought more about their surrogate decisions than their own and incorporated more factors into their decision process: (Male, 75 years) *[asked about any difficulties] "No, not for myself, no. Think that was simple enough. […] There was a lot more thought [for my partner], more thought came into it. I thought would the girls want me to do, my two daughters, things like that you know. Then I thought about the wife again – well she wouldn't want that anyway. Things like that."* Participants were particularly keen to consider: (a) the partner's best interest and (b) their own interest.

Their partner's best interest

Participants mentioned having their partner's best interest at heart, which led them to consider the option most beneficial to their partner's quality of life. Occasionally, they were more focused on a benevolent than a simulated perspective, trying to give them the best outcome possible. Not letting their partner suffer was particularly important and sometimes led them to prioritise that. In fact, participants sometimes considered the right decision as

dependent on its outcome, rather than the way in which it was made: (Male, 65 years) *"You might admit the wrong decision if it turned out that she would be in a terrible state, you know bed-ridden, in a dire nursing home where there's no nurses to clear her up."*

Overall, participants were more willing to have their partner treated than themselves. Deciding about someone else's life, rather than their own, meant that they really did not want to get it wrong. It pushed them to give their partner a better chance of living: (Male, 69 years) *"I was more inclined to let them have the treatment. Just to give them a fighting chance. But for myself, no."* A few mentioned that the mental capacity of their partner would affect their decision-making. They referred to conflicts between a relative's past and present wishes, in cases where they had lost their decision-making capacity. In such situations, participants might override their partner's wishes to make a decision that is in their best interest: (Male, 68 years) *"So I think you have to respect decisions, but there comes a point maybe, if my wife said she wanted to be resuscitated indefinitely on a dementia ward, you'd have to say 'I think it's time to override that'. […] She'd have to have gone past the point of being able to make a rational decision."*

Finally, participants insisted on taking into account the wishes of the family. These decisions obviously have consequences for them and they thought they should be consulted and considered during the decision process: (Female, 66 years) *"I had to really sit and try and imagine, you know, could I go through that, could his family go through the fact it didn't work. The risk of the disruption to our lives and family's lives, because we have someone in that predicament."*

Thinking about their own interest

Participants clearly did not want to lose their partner and were impacted by that prospect when making their decisions: (Male, 70) *"I think we've both got the same concerns of being alive and*

immobile. So that leaves the same worry. But selfish reasons may push me on to have her treated at worse odds than what I would. But that would be selfish reasons again. Nothing else." This feeling was quite strong in a couple of participants who chose to treat their partner a lot more than themselves: (Female, 69 years) *"I would go for a much lower percentage with him, and that's purely emotional because I don't want to lose him. I'm willing to risk that lower percentage, but I don't think he would."* Some participants mentioned that the emotional turmoil of the decision in real life would make it even harder for them to reject a life-saving treatment: (Male, 68 years): "I suspect when you're faced with it, life is very precious. Fear of death is very real."

Participants often had to weigh their own wishes against their partner's, making it difficult to strike the balance. This led them to make a decision that was in line with their partner's wishes, but slightly adjusted to give them a better chance of living: (Female, 67 years) *"I know he would not want to live a very restricted life, or if he didn't have his mental faculties, he wouldn't want that. But then if there's still a chance of, you know, a recovery if you like, I think I would want that. So it's weighing that up."* Participants also considered the impact that their partner's illness would have on their own life. This sometimes tipped the balance the other way in favour of taking less treatment, because a functional or cognitive impairment might be too burdensome on them and the family.

Participants occasionally viewed the responsibility placed on them as a burden, but were prepared to take that responsibility and stand by their decisions: (Male, 68 years) *"These are big decisions and I think you'd certainly be accountable and responsible for it. You might have regrets but at least you could look bad and say 'well I did this in her best interests'."* However, they were sometimes inclined to let their partner be treated to a greater extent than themselves because of that responsibility: (Female, 70 years) *"For him, I would say have the treatment, have it have it have it. It could work, it could work, and that would always be… I wouldn't want*

to be the one to say 'no'." That responsibility was occasionally mentioned as what made the decision process more difficult for their partner than for themselves: (Female, 64 years) *"Because once you're gone you're gone, and I can't bring that back. And if I'm the one who's making the decisions on his behalf, then that's almost even trickier I think, because you're making the decision for somebody else, and you've got to live with that as well."*

Although most made references to an egocentric perspective, it was not usually prioritised over their partner's wishes. They were still capable of setting aside their selfish motives in cases where they strongly conflicted with their partner's wishes: (Female, 66 years) *"If I was purely, if I was very selfish and just thought of me, it would be totally different. […] I have different attitudes to it, the thought of somebody being bedridden and have not compos mentis at all, I think that's pointless."* Crucially, it was recognised that knowing what their partner would want makes it easier to avoid falling into deciding based on selfish reasons: (Female, 70 years) *"If I didn't know what I know, then obviously you'd fight to save your partner's life wouldn't you. To keep them with you. But I know that's not what he wants."*

Discussion

Bringing our findings together

Participants were more inclined to accept a life-saving treatment for others than for themselves, which is in line with previous research showing that people are more likely to favour a life-saving choice for others. This is concurrent with participants reporting they did not want to lose their partner and felt that they should give them a chance of living. We found discrepancies between surrogates' choices and those made by the recipient, indicating evidence of surrogate inaccuracy. However, these results alone do not indicate whether participants intended to go against their partner's wishes: some might have made a best-informed guess

from their knowledge of their partner but got it wrong, whereas others could have known what their partner wanted but chose to make a different decision. Indeed, surrogates reported taking a variety of perspectives to inform their decision-making. Nevertheless, the majority of surrogates intended to decide according to their partner's wishes and held beliefs that aligned with the ethical underpinnings of the substituted judgment standard.

Most participants held the view that they would rather die than end up with a severely compromised quality of life, and showed that they knew their partner did too. Crucially, this indicates that the source of surrogate inaccuracy might not reside in the fact that surrogates misjudged their partners' preferences concerning the choice outcomes, but rather that they misjudged their risk preferences. Surrogates did find the cut off level difficult to judge for their partner. Although the reports showed that participants overall held similar views regarding quality of life, they held quite different intuitions regarding the percentage risk that would be 'too risky'. It is likely that they believed their partner would hold the same intuitions and would only majorly adjust their risk preference if they thought their partner's wishes differed from their own.

Using a mixed methods approach has enabled us to consider both the process and the outcome of the decision in greater depth. The investigation of self-other differences on their own is nowhere near sufficient to understand surrogate decision-making. Drawing from participants' reports is necessary to address the complex processes at play. Similarly, identifying how participants' reports match up to the decisions they made allowed for further nuance in understanding their decision process.

Theoretical implications

Our findings lend support to predictions made by Tunney and Ziegler's (2015) model. Their prediction that a next-of-kin will intend to make a simulated decision in end-of-life

scenarios is concurrent with the finding that most surrogates believed they should adhere to a simulated perspective and thereby intended to decide accordingly. However, no matter how well surrogates felt like they knew their partner's wishes, there was a remaining level of uncertainty for some which they had to overcome. They therefore drew on their own decision-making, which is in line with Tunney and Ziegler's (2015) prediction that surrogates might default to a projected perspective. Moreover, participants considered a benevolent perspective by thinking about whether the treatment they would put their partner through was in their best interest. Finally, participants took an egocentric perspective when thinking about their own wishes for their partner.

It is clear that surrogate decisions can be a lot more complex than suggested by the theories we outlined in the introduction, namely hot-cold empathy gaps (Loewenstein, 2005), the risk-as-feelings hypothesis (Loewenstein et al., 2001) and social values theory (Stone & Allgaier, 2008). Even though self-other differences might seem like they can be explained by these accounts, neither are able to capture the complexity of the decision process and the intricacies across surrogates' experiences. Tunney and Ziegler's model (2015) is far more able to highlight these details.

Practical implications

Participants spontaneously indicated a willingness to honour their partner's wishes, meaning that the fundamentals of the substituted judgement standard are not necessarily misguided and should not be done away with as an ethical framework. However, the problems previously raised about the substituted judgment standard were highlighted in our study. Surrogates found it difficult to ignore other factors, such as what they want for their partner. A few mentioned that if their partner's present wishes were considered unreasonable or discordant with their past wishes, they would override them. Expecting the surrogate to make

a decision they deem unreasonable magnifies the burden placed on them. Participants also conjectured that it would be more difficult to follow in actual fact due to emotional influences, which is reflected in studies of surrogate decisions after the fact (Dionne-Odom et al., 2015; Schenker et al., 2012). The present study therefore shows that, in principle, surrogates would like to follow the substituted judgment standard, but this is not always achievable in practice.

Another problem with the substituted judgment standard is that it is entirely focused on the patient and does not address the burden on the decision-maker. Participants who had not had previous discussions with their partner were in the dark about their partner's wishes, whereas those who had were more confident and comfortable with their decisions. Encouraging people to have these discussions in the later part of their lives would be a good strategy to ease the process. Indeed, a retired health care professional insisted that these discussions between family members do not happen enough prior to the event. Promoting advance care planning practices could be a way to encourage people to discuss their healthcare preferences with their loved ones. To be most effective, it should consider factors which can help surrogates make decisions in all kinds of scenarios, such as the chance of recovery following treatment as our study shows that partners may not be aware they have different risk preferences.

Limitations

Our study used hypothetical scenarios. Although some participants were certain they would make the same decisions in real life, it was apparent that others were not. Some mentioned that the fear of death would be more imminent in a real scenario, and although they would like to think that they would stick to their current decisions, they felt that they might be led towards a different direction. Indeed, in reports which took place after the fact, the tensions felt by surrogates which prevented them from honouring the recipient's wishes were more apparent (Dionne-Odom et al., 2015; Fetherstonhaugh et al., 2017; Schenker et al., 2012).

Our findings might not be easily generalisable to the wider population. It is conceivable that the surrogate decision differs by demographic (education, socioeconomic status, religion etc). Although we did not collect extensive demographic information, it can be inferred that participants were numerically literate given that they were all able to complete the task which involved making judgments about probabilities. Moreover, most participants were open to speaking about end-of-life. The recruitment process clearly stated that the study would involve thinking about severe illnesses and death, which would have discouraged those unwilling to do so. The participants we recruited would presumably be more likely to have these discussions with their partner. Participants who are less numerically literate and open to speaking about end-of-life might have made different decisions. Future research should be extended to different populations to investigate whether their decision process is different to our findings.

Conclusions

Taking a mixed methods approach enabled us to bring together two facets of surrogate decision-making and their respective literatures. Surrogates did believe that end-of-life decisions for their partner should respect their partner's wishes, which suggests that the substituted judgment standard is not necessarily inadequate. On the other hand, it is clear that surrogates also incorporate other perspectives in their decision-making and cannot entirely put their own wishes aside. We showed that manifestations of surrogate inaccuracy are not necessarily due to surrogates failing to decide according to their partner's wishes. Instead, it could be due to individual differences in risk preferences rather than simply a misjudgement of the recipient's wishes. Future research should further explore the sources of inaccuracy to help surrogates make better informed judgments about their partner's wishes. Finally, our study suggests that surrogates draw from prior discussions with their partner, which give them the confidence that they are making the right decision. Future work should investigate whether

encouraging families to speak about end-of-life makes the process less conflictual, distressing and uncertain.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the University of Nottingham School of Psychology's ethics committee on 27.03.18. All participants gave informed consent before taking part in the study.

Consent for publication

All participants gave consent for the data that was collected to be used for publication purposes, including quotes from their interviews.

Availability of data and materials

The quantitative dataset used and analysed during the current study is available from the corresponding author on request. The full qualitative dataset is not available to avoid compromising individual privacy.

Competing interests

The authors declare that they have no competing interests.

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financially supported the study but did not have a role in the study design, data collection/analysis/interpretation or manuscript preparation.

Authors' contributions

EB designed and conducted the study and drafted the manuscript. RT and EF supervised the study and edited the manuscript.

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Supplementary File 1 – WALT instrument

Decisions for the self

Death. Think about your current state of health. Now imagine that you are suddenly sick with an illness that requires you to be in the hospital for weeks to months. In the hospital, you are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. You also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Without the treatment, you will not survive. The doctor tells you there is a X% chance that the treatment will work and get you back to your current state of health and a X% chance that it will not work and you will not survive. Do you want the treatment?

Functional impairment. Think about your current state of health. Now imagine that you are suddenly sick with an illness that requires you to be in the hospital for weeks to months. In the hospital, you are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. You also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, you would be in a state where you would be bedbound. You would not be able to get up out of bed to the bathroom by yourself, and you would need help with all of your daily activities. Without the treatment, you will not survive. The doctor tells you there is a X% chance that the treatment will work and get you back to your current state of health and a X% chance that it will not work and you will be bedbound. Do you want the treatment?

Cognitive impairment. Think about your current state of health. Now imagine that you are suddenly sick with an illness that requires you to be in the hospital for weeks to months. In the hospital, you are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. You also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, you would be in a state where your mind would not be working, such that you would not be aware of what was going on around you or be able to recognize your loved ones. Without the treatment, you will not survive. The doctor tells you there is a X% chance that the treatment will work and get you back to your current state of health and a X% chance that it will not work and you will be unaware. Do you want the treatment?

Decisions for partner

Death. Think about your partner's current state of health. Now imagine that they are suddenly sick with an illness that requires them to be in the hospital for weeks to months. In the hospital, they are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. They also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Without the treatment, they will not survive. The doctor tells you there is a X% chance that the treatment will work and get your partner back to their current state of health and a X% chance that it will not work and your partner will not survive. Would you choose the treatment for them?

Functional impairment. Think about your partner's current state of health. Now imagine that they are suddenly sick with an illness that requires them to be in the hospital for weeks to months. In the hospital, they are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. They also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, they would be in a state where they would be bedbound. They would not be able to get up out of bed to the bathroom by themselves, and they would need help with all of their daily activities. Without the treatment, they will not survive. The doctor tells you there is a X% chance that the treatment will work and get your partner back to their current state of health and a X% chance that it will not work and your partner will be bedbound. Would you choose the treatment for them?

Cognitive impairment. Think about your partner's current state of health. Now imagine that they are suddenly sick with an illness that requires them to be in the hospital for weeks to months. In the hospital, they are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. They also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, they would be in a state where their mind would not be working, such that they would not be aware of what was going on around them or be able to recognize their loved ones. Without the treatment, they will not survive. The doctor tells you there is a X% chance that the treatment will work and get your partner back to their current state of health and a X% chance that it will not work and your partner will be unaware. Would you choose the treatment for them?

Supplementary File 2 – Interview Guide

I. Thought processes and experiences when making surrogate decisions

- I would like you to think back to when you were making decisions for your partner. Could you walk me through that process?
- What thoughts did you have? Did you picture the possible consequences in your head? Were there any points where you were hesitating?
- What was the most important factor for you? Any particular information in the scenarios that drove your decision? Did you consider anything else?
- What was the most challenging?

II. Discussion of surrogate decisions

- How do you feel about the decisions that you made? Do you think you made the right decisions? What makes you think you made the right decisions (or not)?
- How do you see your role in making these decisions for your partner? Would you feel responsible for the outcome? Do you think that affected your decisions?
- Do you think these decisions are what your partner would want? What would be the most important factor for your partner?
- Would you want to be the person making these decisions for your partner? Would you be the best person to make them?

III. Thought processes when making own decisions

- Now I would like you to think back to when you made decisions for yourself. Could you walk me through that process?
- How did this compare to when you made decisions for your partner? Do you think you made different decisions for you than for your partner?
- Would you want your partner to be making these decisions for you?
- In real life, do you think you would make the same decisions that you made today?

- That is all the questions I had for you today. Is there anything that you would like to add?

Self-other differences. Participants' indifference points were entered into a 2 (recipient) x 3 (outcome) repeated-measures ANOVA (Figure S1). The main effect of recipient was close to significance ($F_{1,23}$=3.586, MS_e=697.101, p=.071, η_p^2=0.135). We found a main effect of outcome ($F_{2,46}$=24.843, MS_e=290.187, p<.001, η_p^2=0.519). A simple effects analysis showed that participants were more likely to accept treatment in the death scenario than in the functional impairment scenario (mean difference=-15.625, p<.001) and the cognitive impairment scenario (mean difference=-24.167, p<.001). Participants were also more likely to accept treatment in the functional impairment scenario than in the cognitive impairment scenario (mean difference=-8.542, p<.001). The interaction between recipient and outcome was close to significance ($F_{2,46}$=3.119, MS_e=114.221, p=.054, η_p^2=0.119) and followed a significant linear trend ($F_{1,30}$=4.452, MS_e=134.783, p=.046, η_p^2=0.162).

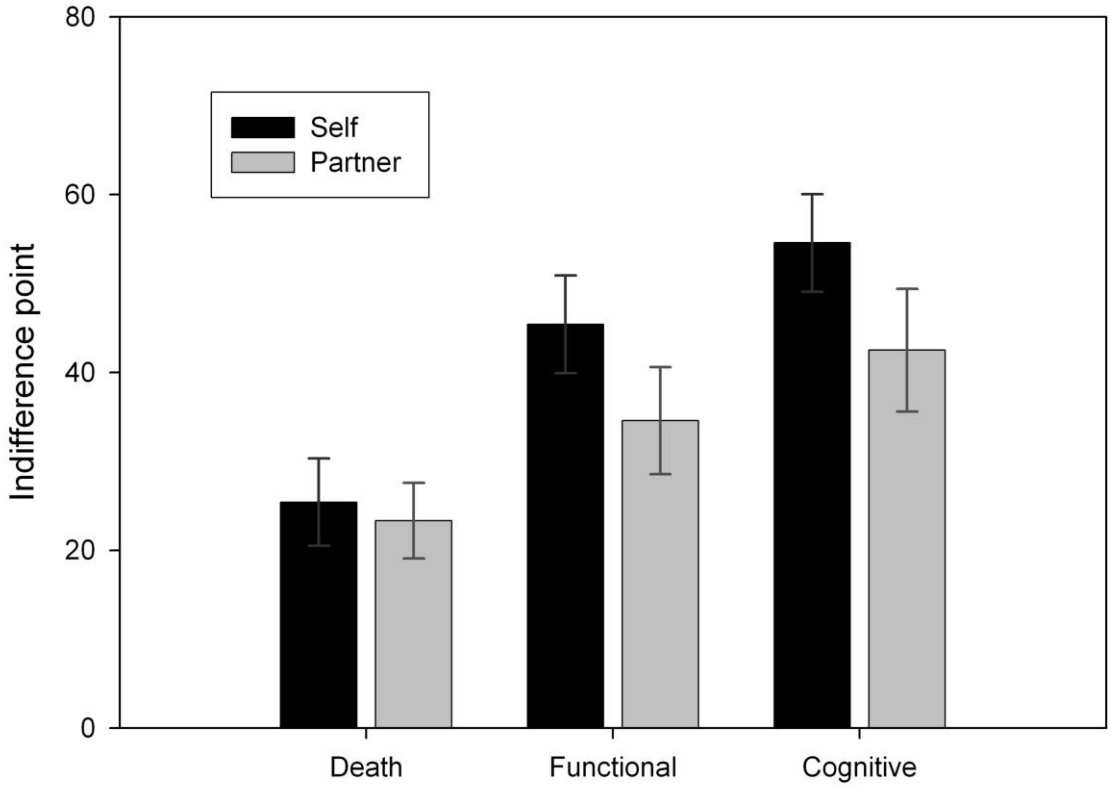

Figure S1: Participants' indifference points for themselves versus their partner for each treatment outcome. Lower values indicate that participants were willing to accept a treatment with a lower chance of recovery and a higher risk of reduced quality of life. Error bars represent the standard error of the mean.

Surrogate accuracy. We examined whether these values significantly deviated from 0 using one-sample t-tests (see Figure S2). This was the case for death (t_{23}=3.904, p=.001), functional impairment (t_{23}=7.000, p<.001) and cognitive impairment (t_{23}=6.544, p<.001) scenarios. To investigate whether accuracy differed by scenario, we conducted a repeated-measures ANOVA with outcome as a three-level factor. We found a main effect of outcome ($F_{2,46}$=4.531, MS_e=314.795, p=.016, η_p^2=0.165). Pairwise comparisons showed that accuracy in the death scenario was higher than in the functional impairment scenario (mean difference=-12.917, p=.017), as well as higher than in the cognitive impairment scenario (mean difference=-13.750, p=.026). Accuracy between the functional and cognitive impairment scenarios did not differ (p=.853). Surrogate decisions were less likely to be accurate when the outcome involved living with a reduced quality of life rather than death.

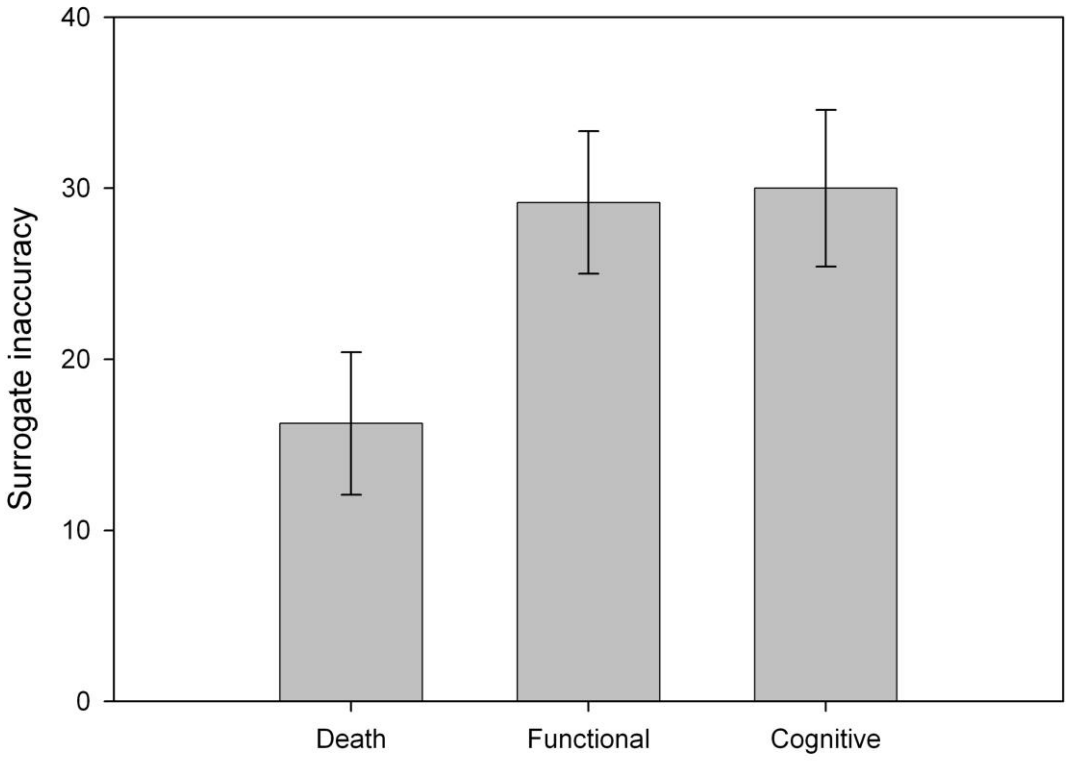

Figure S2: The deviation between surrogate decisions and the recipient's decisions. Error bars represent the standard error of the mean. Higher values indicate that surrogate decisions were less accurate.

Paper 6

On the likelihood of surrogate conforming to the substituted judgment standard when making end-of-life decisions for their partner

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On the Likelihood of Surrogates Conforming to the Substituted Judgment Standard When Making End-of-Life Decisions for Their Partner

Eleonore Batteux, Eamonn Ferguson, and Richard J. Tunney

A considerable proportion of end-of-life decisions are made by the patient's next-of-kin, who can be asked to follow the substituted judgment standard and decide based on the patient's wishes. The question of whether these surrogate decision makers are actually able to do so has become an important issue. In this study, we examined how the likelihood of surrogates conforming to the substituted judgment standard varies with individual differences in mortality acceptance and confidence in their decision making. We recruited 153 participants in romantic relationships between 18 and 80 years old from the general population. We asked them to make hypothetical end-of-life decisions for themselves and on behalf of their partner, as well as predict what their partner would do, and complete a series of questionnaires. Participants predicted that their partner would make similar decisions to their own but were more likely to accept a life-saving treatment that could result in reduced quality of life on their partner's behalf than for themselves. Decisions made by older adults were more likely to conform to the substituted judgment standard, which is encouraging given that they are more likely to be confronted with these decisions in real life, although this was not due to differences in mortality acceptance. Older adults were also more likely to have had previous discussions with their partner and thereby know that person's wishes and feel confident that they made the right decision, but these factors did not affect their likelihood of conforming to the substituted judgment standard. This shows that encouraging discussions about end of life among families would ease the decision process, but more work is needed to ensure that surrogates can adhere to the substituted judgment standard.

Keywords
surrogate decision making, end of life, aging, substituted judgment standard

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More than 70% of deaths in intensive care units (ICU) are the result of decisions to withhold or withdraw life-sustaining treatment, but only about 5% of patients are able to make these decisions for themselves.[1] In these circumstances, it is common for a next-of-kin to act as a surrogate decision maker. They are often instructed to follow the substituted judgment standard, whereby they must make a decision based on their knowledge of the patient's preferences. This varies according to each country's legislation. It is the case in the United States that surrogates are required to follow the substituted

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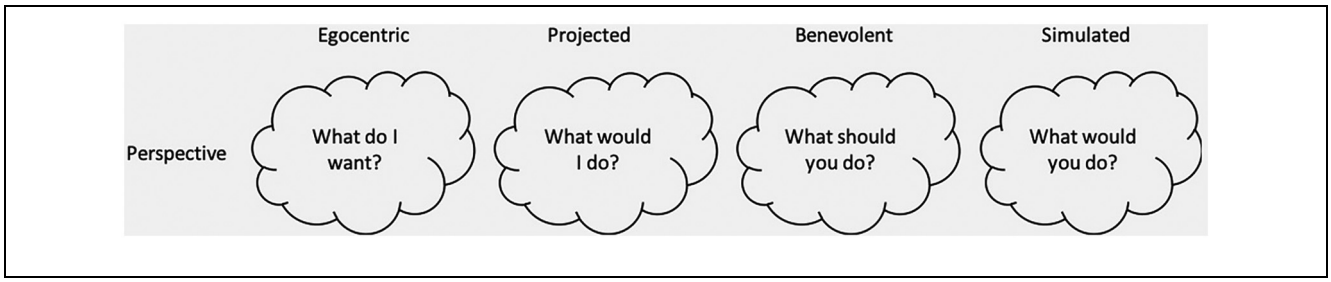

Figure 1 Tunney and Ziegler's model[3] of surrogate decision making in which the surrogate considers various perspectives to make a choice.

judgment standard. In the United Kingdom, they are instructed to consider both the patient's wishes and his or her best interests. However, doubts have been cast on the suitability of the substituted judgment standard, given that it assumes that surrogates are able to decide according to the patient's preferences.

The question of whether surrogates can accurately predict their next-of-kin's wishes has been extensively posed. A systematic review of the literature has found that surrogate accuracy is around 68%,[2] meaning that a significant proportion of surrogate decision makers did not meet the substituted judgment standard. A second question that has arisen is whether surrogates do make their decisions according to their predictions of the surrogates' preferences or whether they choose differently. In this article, we investigate whether a range of factors affects surrogates' propensity to make a decision that conforms with the substituted judgment standard in end-of-life scenarios.

Tunney and Ziegler's model[3] of surrogate decision making assumes that the decision maker engages in perspective taking, which varies according to particular features of the decision (see Figure 1). Surrogates try to adopt the perspective that matches the required benchmark when making end-of-life decisions, given that they are highly significant decisions for which they could be held accountable. If surrogates are instructed to follow the substituted judgment standard, they should engage in simulated perspective taking (predicting what the recipient *would* do). Simulation historically refers to the psychological ability to put oneself in other people's shoes to predict their behavior.[4] This requires acknowledging the differences between the surrogate and the recipient to simulate what they would have done. The substituted judgment standard expects that surrogates take a simulated perspective when making their decision. A simulated decision would be a decision that conforms to the surrogate's predictions of what the recipient would have done. However, they might also follow a benevolent perspective (what the recipient *should* do) to preserve the recipient's best interests or engage in an egocentric perspective (what the surrogate wants) to preserve their own interest. Finally, surrogates might rely on a projected perspective (what the surrogate would do in the recipient's situation) if in doubt about the recipient's preferences. This is different from the simulated perspective in that it does not take any differences between the surrogate and the recipient into account. The model therefore assumes that surrogates can be prevented from strictly adhering to the substituted judgment standard, even if they intend to make a simulated decision. What can previous research tell us about the way surrogates make end-of-life decisions?

Studies that have investigated whether decision making on behalf of other people differs from decisions made for ourselves have found that we are more likely to avoid taking high risks for others. This has been shown both when medical professionals make decisions for patients[5,6] and when people from the general population decide for a stranger or family member.[7–9] Irrespective of the illness or treatment in question, surrogates are more likely to favor the option that is most likely to preserve the patient's life. When deciding for themselves, people are more inclined to accept or refuse a treatment that could increase their chances of dying to avoid an illness[10] or complications from a treatment.[6]

These findings have been interpreted as surrogates being more cautious when deciding for someone else, rather than surrogates believing that the recipients would also be more cautious for themselves. Surrogate decisions have in fact been shown to differ from surrogate predictions—people predict others to take similar risks as they would, but surrogates take fewer risks for others than for themselves.[11,12] On the other hand, in a within-subjects design, we found that surrogate predictions were significant predictors of surrogate choices, independently

of the decision maker's own choices.[13] This suggests that surrogates do not simply disregard the recipient's preferences but are influenced by other factors.

Qualitative reports of surrogates' experiences after the fact confirm that they intend to follow the substituted judgment standard.[14–16] They draw on their knowledge of the recipient's wishes, which reassures them that they are making the right decision, but struggle to ignore other factors. For example, surrogates feel a responsibility to preserve the patient's life and the family's well-being. They also find it difficult to disregard their own wishes for their loved one (i.e., that they do not want to lose them). This confirms suspicions that the substituted judgment standard is difficult to meet and is usually not adhered to in reality.

A recent mixed-methods study[17] revealed a number of factors that affect surrogates' propensity to make a simulated decision (i.e., decide based on their knowledge of the recipient's wishes). Older adult partners were asked to make a series of end-of-life decisions for each other before being interviewed about their decision process. Participants were more likely to take a life-sustaining treatment for their partner than their partner did for themselves, thereby resulting in surrogate inaccuracy. However, surrogates reported that they drew on their knowledge of the recipient's wishes to inform their decisions, which gave them the confidence that they were making the right decision. It seemed to be the case that those who had previous discussions with their partner were more confident, which, in turn, made them more likely to take a simulated perspective. They also seemed more comfortable with mortality and had had experiences of life-threatening illnesses, either themselves or through a close relative. They therefore appeared more prepared to make a decision that would end their partner's life if they believed those were his or her wishes. In the present study, we drew from this to experimentally investigate how these factors affect surrogates' propensity to make a simulated decision in end-of-life scenarios and conform to the expectations of the substituted judgment standard.

We recruited participants from the general population and asked them to make hypothetical end-of-life decisions for themselves and their partner. They were also asked for their surrogate predictions (i.e., to indicate what they expect their partner would decide for himself or herself). This allowed us to compare their surrogate decisions to their surrogate predictions to evaluate the extent to which they made a simulated decision. The more similarities there were between the two, the more participants were considered to have made a simulated decision. They then had to indicate their confidence that they made the right decision, their knowledge of their partner's wishes, and whether previous discussions on the matter had taken place. We measured their fear of their own and their partner's death to assess their acceptance of mortality. Finally, participants reported their previous experiences relating to illness and death. We recruited a large range of ages given that these measures are likely to vary with age. We could then assess whether surrogates' propensity to make a simulated decision for their partner varied with age and length of relationship. This study was preregistered with Open Science Framework (https://osf.io/bsjf8/). Our preregistered hypotheses were as follows:

Hypothesis 1. We expected that participants would predict that their partner would make similar end-of-life decisions to their own but would be more willing to make a decision that would lead to their own life ending rather than their partner's.

Hypothesis 2. We expected that older adults would be more likely to have experiences of illness and death, thereby making them more accepting of mortality for themselves (2a) and for their partner (2b). We predicted this to increase their likelihood to refuse treatment, both for themselves (2c) and for their partner (2d).

Hypothesis 3. We expected that older adults would be more likely to have experiences of illness and death, thereby making them more accepting of their partner's mortality. We, therefore, predicted that older adults were more likely to have discussions with their partner, which in turn increases surrogates' knowledge of their partner's wishes and confidence that they were making the right decision (3a). We expected this to increase their likelihood of making a simulated decision (3b) and lead to smaller self-partner differences (3c). (We erroneously indicated that this would lead to larger self-other differences in our preregistration form; we expect a higher propensity of a simulated decision to be linked to smaller self-other differences.)

Hypothesis 4. We expected longer relationships with a partner to increase previous discussions, knowledge of wishes, and confidence in making the right decision. We predicted that this in turn would increase their likelihood of making a simulated decision.

Methods

Design

The study was a within-subjects design where participants made decisions for themselves and their partner, as

well as predicted their partner's wishes. The order in which these were completed was randomized.

Participants

We recruited participants online via Prolific (https://prolific.ac) from the United Kingdom. Given that we could not derive an estimated effect size for our study based on previous research, we hypothesized that we would find a medium effect size. We conducted a power analysis using G*Power 3.1 to determine the necessary sample size to detect a medium effect size using a multiple linear regression with 7 predictors (to test hypothesis 3). A sample size of 153 is required to detect a medium effect size ($f^2 = 0.15$) with high power (>.95) and an acceptable α level (<.05). This sample size allows for enough power to test the remainder of our hypotheses: detection of a medium effect ($d = 0.5$) of recipient (hypothesis 1), with high power (>.95) and an acceptable α level (<.05), and mediated effects (hypotheses 2–4), assuming that the α and β paths have medium effect sizes.[18] We therefore recruited 153 participants who were in a romantic relationship. To obtain a range of ages, we recruited older adults (60–80) separately from younger adults (18–59). Ethical approval was obtained from the University of Nottingham's ethics committee.

Decision-Making Task

Participants completed 2 scenarios adapted from the willingness to accept life-sustaining treatment (WALT)[19] instrument. Each scenario depicted a life-threatening situation in which participants are taken to the hospital for weeks to months. They are offered a high-burden treatment course to recover by a doctor. The probability of the treatment working varied from 90% to 10% in decrements of 10. In each case, participants had to indicate whether they would want the treatment or not. They were told that they would not survive without treatment. Each scenario varied in terms of the outcome of the treatment: either the treatment works and their current health is restored, or the treatment does not work and they end up bedbound (functional impairment scenario) or end up unaware (cognitive impairment scenario). The order in which they completed each scenario was randomized. They completed the task 3 times in a random order: once making decisions for themselves (*self*), once on behalf of their partner (*partner*), and once where they had to predict what they thought their partner would choose (*prediction*). The exact wording of the scenarios can be found in Supplementary File 1.

Questionnaires

Participants completed a series of questionnaires after the WALT instrument (see Supplementary File 1). They were first asked questions relating to the scenarios they had completed: whether they had previously discussed end-of-life scenarios with their partner (*discussions*), whether they felt like they knew their partners' wishes (*knowledge*), and how confident they were that they made the right decision for themselves and then for their partner (*confidence*) (on a scale from 1–5). The order in which they were presented with these questions was randomized. As a measure of *fear of their own death* and *fear of their partner's death*, participants completed a revised version of the Collett-Lester Fear of Death scale version 3.0.[20] Scale reliability of *fear of their own death* ($\alpha = 0.85$) and *fear of their partner's death* ($\alpha = 0.81$) was good. Finally, they completed a shortened version of the revised Life Stressor Checklist, which included questions specific to *experiences* of illness and death.[21]

Analysis Procedures

We computed indifference points for each scenario and condition (i.e., the point at which participants were indifferent between accepting or rejecting the treatment). We considered the indifference point to be the average of the 2 probabilities on each side of the crossover point from accepting to refusing the treatment. We then took the average of the indifference point for both scenarios as a measure of willingness to accept treatment for each recipient. We excluded participants who made inconsistent choices (e.g., selecting a treatment with a 40% chance of recovery but not a 100% chance) as we could not compute an indifference point for them. We considered inconsistent choices to be problematic as we assumed that they indicated that the participant did not understand or pay attention to the task (particularly if they selected only 1 option, but it was not a 100% chance of recovery). There is a possibility that inconsistent choices show that the participants were conflicted, but their responses to the task would be difficult to interpret, so we did not analyze their choices further. We chose to compute the indifference point rather than the proportion of times participants selected the treatment option to avoid including participants who may not have understood or paid attention to the task. We subtracted *partner* from *self* to have a measure of self-other differences: positive values meant that participants accepted more treatment for their partner than for themselves. We subtracted *prediction* from *partner* and removed the sign to have a measure of simulation. We then reverse scored it

Table 1 Participant Characteristics

Characteristic	Participants
Sex, female, %	54
Age, mean (SD), y	45.63 (21.28)
Young adults (aged 18–34 years), %	41
Middle-aged adults (aged 35–59 years), %	12
Older adults (aged 60–80 years), %	47
Length of relationship, mean (SD), y	20.28 (18.37)
Young adults (aged 18–34 years), mean (SD), y	3.35 (3.99)
Middle-aged adults (aged 35–59 years), mean (SD), y	19.10 (10.22)
Older adults (aged 60–80 years), mean (SD), y	35.17 (14.37)

so that higher values meant that surrogate decisions deviated less from surrogate predictions and that surrogates were more likely to have made a simulated decision. For every participant, we summed their scores for each item of the fear of death scales and the life experience scale. We analyzed our data as stated in our preregistration as well as some exploratory analyses, which were all conducted in SPSS (SPSS, Inc., an IBM Company, Chicago, IL). For our correlation analyses, we used Pearson's r for continuous variables and Spearman's ρ for ordinal variables. All mediation analyses were performed using the PROCESS macro for SPSS.[22] Effects were calculated for each 5000 bootstrapped samples.

Results

We recruited 167 participants overall as 6 were excluded for not being in a relationship and 8 were excluded for making choices from which we could not compute an indifference point. All 8 participants we excluded selected a treatment with a lower chance of recovery than 100% but did not select the treatment with a 100% chance of recovery. We assumed that they did not understand or pay attention to the task. We then ended up with 153 participants, as required by our power analysis. Participant characteristics can be found in Table 1.

Preregistered Analyses

Hypothesis 1. We analyzed participants' treatment choices to investigate hypothesis 1. We entered participants' indifference points into a repeated-measures analysis of variance (ANOVA) with recipient (self, predict, partner) as a 3-level factor. The main effect of recipient was significant ($F_{2,\ 304} = 11.226$, $MS_e = 163.872$, $P < 0.001$, $\eta_p^2 = 0.069$) and followed a linear trend ($F_{1,\ 152} = 17.943$, $MS_e = 192.753$, $P < 0.001$, $\eta_p^2 = 0.106$). Pairwise comparisons showed that participants were more willing to accept treatment for their partner than for themselves (mean difference = 6.72, $P < 0.001$). There was no difference between their own choices and their surrogate predictions (mean difference = 1.89, $P = 0.211$), but participants accepted more treatment for their partner than they predicted their partner would (mean difference = 4.83, $P < 0.001$). Hypothesis 1 was supported by our findings.

Hypothesis 2. Age was positively correlated with experiences ($r_s = .228$, $P = 0.005$). However, experiences were not significantly correlated with fear of their own death ($r_s = -.132$, $P = 0.103$) or their partner's death ($r_s = -.085$, $P = 0.297$). The indirect effect between age and self with experiences and fear of own death as mediators was not significant, nor was the one between age and partner with experiences and fear of partner's death as mediators (see Supplementary File 2 for the full analysis). Hypothesis 2 was overall not supported, apart from the fact that experiences varied with age.

Hypothesis 3a. Age was positively correlated with discussions ($r_s = .206$, $P = 0.032$). Discussions were positively correlated with knowledge ($r_s = .491$, $P < 0.001$), and knowledge was positively correlated with confidence ($r_s = .547$, $P < 0.001$). The mediation analysis examined the link between age and confidence with discussions and knowledge as mediators. The total effect of age on confidence was not significant ($B = 0.005$ [–0.002, 0.012], $SE = 0.003$, $P = 0.168$). The direct effect of age on discussions was significant ($B = 0.011$ [0.003, 0.018], $SE = 0.038$, $P = 0.006$) and accounted for 4.94% of the variance in discussions. The direct effect of age on knowledge was not significant ($B = -0.002$ [–0.008, 0.005], $SE = 0.003$, $P = 0.599$), but discussions on knowledge were ($B = 0.453$ [0.315, 0.592], $SE = 0.070$, $P < 0.001$); age and discussions accounted for 22.2% of the variance in knowledge ($F_{2,\ 150} = 21.427$, $P < 0.001$). The direct effects of age ($B = 0.003$ [–.004, 0.009], $SE = 0.003$, $P = 0.400$) and discussions ($B = 0.085$ [–0.061, 0.230], $SE = 0.074$, $P = 0.251$) on confidence were not significant, but knowledge was significantly linked to confidence ($B = 0.402$ [0.252, 0.552], $SE = 0.076$, $P < 0.001$); age, discussions, and knowledge accounted for 24.1% of the variance in confidence ($F_{3,\ 149} = 15.787$, $P < 0.001$). The indirect effect of age on confidence was not significant through discussions (effect = 0.009 [–0.001, 0.003]) or knowledge (effect = −0.001 [–0.003, 0.003]), but it was significant through discussions and

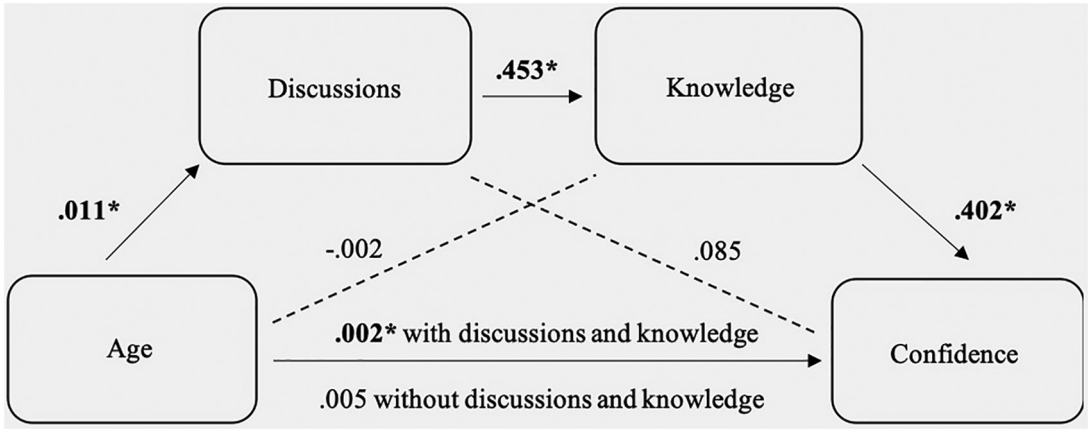

Figure 2 Mediation model showing the relationship between participants' age and confidence, mediated by previous discussions and knowledge of their partner's wishes. If significant ($P < 0.05$), unstandardized regression coefficients are denoted with an asterisk. The mediation model was significant.

knowledge (effect = 0.002 [0.001, 0.004]). See Figure 2 for a representation of the model. Hypothesis 3a, which expected older adults to be more confident they made the right decision due to previous discussions and increased knowledge of their partner's wishes, was supported.

Hypothesis 3b. The likelihood of making a simulated decision was positively correlated with age ($r = .171$, $P = 0.035$): increased age led to a higher likelihood of making a simulated decision. However, simulation was not significantly correlated with discussions ($r_s = -.010$, $P = 0.904$), knowledge ($r_s = .111$, $P = 0.171$), or confidence ($r_s = .098$, $P = 0.227$). The indirect effect between age and simulation with discussions, knowledge, and confidence as mediators was not significant (see Supplementary File 2). Hypotheses 3b was only supported insofar as simulation was linked to age.

Hypothesis 3c. The self-partner difference was not correlated with age ($r_s = .046$, $P = 0.576$) or discussions ($r_s = -.024$, $P = 0.769$), but the correlation with knowledge fell short of significance ($r_s = -.157$, $P = 0.052$). Confidence was negatively correlated with the self-partner difference ($r_s = -.213$, $P = 0.008$): increased confidence meant participants were less likely to accept more treatment for their partner than for themselves. The mediation analysis examined the link between age and the self-partner difference with discussions, knowledge, and confidence as mediators. The total effect of age on self-partner differences was not significant ($B = 0.065$ [–0.083, 0.213], $SE = 0.075$, $P = 0.385$). The direct effect of age on discussions was significant ($B = 0.011$ [0.003, 0.018], $SE = 0.038$, $P = 0.006$) and accounted for 4.94% of the variance in discussions. The direct effect of age on knowledge was not significant ($B = -0.002$ [–0.008, 0.005], $SE = 0.003$, $P = 0.599$), but discussions on knowledge were ($B = 0.453$ [0.315, 0.592], $SE = 0.070$, $P < 0.001$); age and discussions accounted for 22.2% of the variance in knowledge ($F_{2,\ 150} = 21.427$, $P < 0.001$). The direct effects of age ($B = 0.003$ [–0.004, 0.009], $SE = 0.003$, $P = 0.400$) and discussions ($B = 0.085$ [–0.061, 0.230], $SE = 0.074$, $P = 0.251$) on confidence were not significant, but knowledge was significantly linked to confidence ($B = 0.402$ [0.252, 0.552], $SE = 0.076$, $P < 0.001$); age, discussions, and knowledge accounted for 24.1% of the variance in confidence ($F_{3,\ 149} = 15.787$, $P < 0.001$). The direct effect of confidence on self-partner differences was significant ($B = -5.470$ [–9.399, –1.541], $SE = 1.988$, $P = 0.007$), but the direct effects of age ($B = 0.084$ [–0.066, 0.234], $SE = 0.076$, $P = 0.271$), discussions ($B = 0.205$ [–3.342, 3.752], $SE = 1.795$, $P = 0.909$), and knowledge ($B = 1.741$ [–2.229, 5.170], $SE = 2.009$, $P = 0.388$) were not; age, discussions, knowledge, and confidence accounted for 5.43% of the variance in self-other differences ($F_{4,\ 148} = 2.126$, $P = 0.080$). The indirect effect of age on self-partner differences through discussions, knowledge, and confidence was significant (effect = –0.011 [–0.028, –0.001]), but none of the other indirect effects were. See Figure 3 for a representation of the model. Overall, hypothesis 3c was supported.

Hypothesis 4. Length of relationship was positively correlated with discussions ($r_s = .218$, $P = 0.007$), which

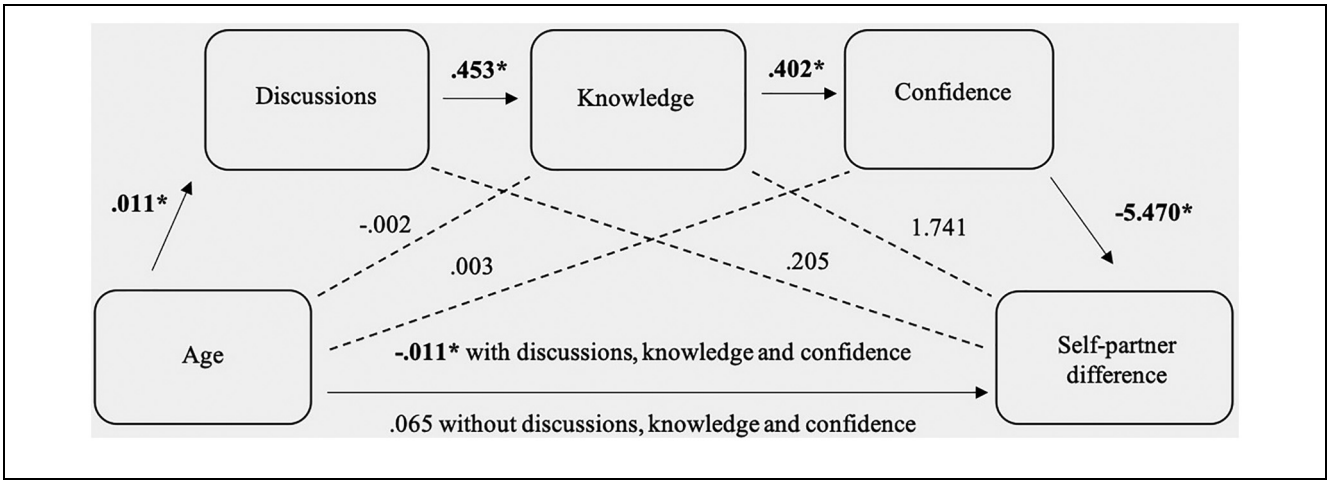

Figure 3 Mediation model showing the relationship between participants' age and self-partner difference, mediated by previous discussions, knowledge of their partner's wishes, and their confidence that they made the right surrogate decision. If significant ($P < 0.05$), unstandardized regression coefficients are denoted with an asterisk. The mediation model was significant.

were positively correlated with knowledge ($r_s = .491$, $P < 0.001$), which in turn was positively correlated with confidence ($r_s = .547$, $P < 0.001$). Simulation was positively correlated with length of relationship ($r = .193$, $P = 0.017$): longer relationships led to a higher likelihood of making a simulated decision. The indirect effect between length of relationship and simulation with discussions, knowledge, and confidence as mediators was not significant (see Supplementary File 2).

Regression analysis. We conducted a hierarchical regression analysis with age (step 1), experience and fear of partner's death (step 2), and discussions, knowledge, and confidence (step 3) as predictors of the likelihood of making a simulated decision. We did not enter length of relationship as a predictor to avoid collinearity problems as it was highly correlated with age ($r = .865$, $P < 0.001$). Step 1 was significant ($F_{1, 151} = 4.543$, $P = 0.035$, $R^2 = 0.029$), with an increase in age leading to an increase in the likelihood of making a simulated decision ($B = 0.097$, $SE = 0.046$, $P = 0.035$). Step 2 ($F_{3, 149} = 2.132$, $P = 0.099$, $R^2 = 0.041$) and step 3 ($F_{6, 146} = 2.903$, $P = 0.057$, $R^2 = 0.079$) fell short of significance. Age was the only variable that consistently predicted simulation. Full results can be found in Table 2.

Table 2 Regression Model for Likelihood of Making a Simulated Decision

		B	*SE*	*P*
1	Constant	15.710	2.301	<0.001
	Age	0.097	0.046	**0.035**
2	Constant	25.283	7.460	0.001
	Age	0.102	0.048	**0.035**
	Experiences	0.354	0.703	0.615
	Fear of death	0.207	0.161	0.199
3	Constant	38.010	9.313	<0.001
	Age	0.103	0.048	**0.034**
	Experiences	0.429	0.733	0.559
	Fear of death	0.265	0.165	0.111
	Discussions	–1.185	1.152	0.305
	Knowledge	1.661	1.273	0.194
	Confidence	1.684	1.227	0.172

Note: The bold p-values represent statistically significant results at p < .05.

Exploratory Analyses

Treatment choices. To further examine the relationship between surrogate decisions and predictions, we conducted Pearson's correlations. Surrogate choices and predictions were positively correlated ($r = 0.860$, $P < 0.001$). Partial correlations between surrogate choices and predictions, controlling for participants' own choices, were significant ($r = 0.639$, $P < 0.001$). We then performed regression analyses to assess whether surrogate predictions were predictive of surrogate choices, independently of participants' own choices. We found that the model was significant ($F_{2, 150} = 253.352$, $P < 0.001$) and accounted for 77.2% of the variance in surrogate choices. Surrogate predictions significantly predicted surrogate choices ($B = 0.700$, $SE = 0.069$, $P < 0.001$), but so did participants' own choices ($B = 0.313$, $SE = 0.069$, $P < 0.001$).

Discussions. We assessed whether experiences of illness and death had a relationship with surrogates' propensity to discuss end-of-life scenarios, controlling for age. We found a positive relationship between the two (r_s = .358, $P < 0.001$). We conducted a hierarchical regression analysis with age (step 1) and experience (step 2) as predictors of discussions. Step 1 was significant ($F_{1,\ 151} = 7.798$, $P = 0.006$, $R^2 = 0.049$), with any increase in age leading to an increase in discussions ($B = 0.011$, $SE = 0.004$, $P = 0.006$). Step 2 ($F_{2,\ 150} = 11.239$, $P < 0.001$, $R^2 = 0.142$) was also significant, with an increase in experience leading to an increase in discussions ($B = 0.224$, $SE = 0.056$, $P < 0.001$). Age was no longer a significant predictor ($B = 0.007$, $SE = 0.004$, $P = 0.071$).

Confidence. We conducted a paired-samples t test to compare participants' confidence that they made the right decision for themselves to their confidence that they made the right decision for their partner. We found that participants were significantly more confident for themselves (mean = 4.19, SD = 0.82) than for their partner (mean = 3.86, SD = 0.91) ($t_{1,\ 152} = 5.300$, $P < 0.001$).

Fear of death. We split each scale into the 2 subscales of the original Collet-Lester fear of death scale[20]: the prospect of death itself and the process of dying (see Supplementary File 2). We entered participants' scores for each subscale into a 2 (person) × 2 (subscale) repeated-measures ANOVA. We found a main effect of person: participants were more fearful of their partner's death than their own ($F_{1,\ 152} = 110.417$, $MS_e = 12.634$, $P < 0.001$, $\eta_p^2 = 0.421$). We found a main effect of subscale: participants were more fearful of the process of dying than the prospect of death ($F_{1,\ 152} = 23.085$, $MS_e = 8.376$, $P < 0.001$, $\eta_p^2 = 0.132$). We also found an interaction between person and subscale ($F_{1,\ 152} = 120.889$, $MS_e = 6.261$, $P < 0.001$, $\eta_p^2 = 0.113$). Pairwise comparisons showed that participants were more fearful of the process of dying than the prospect of death for themselves (mean difference = −2.013, $P < 0.001$) but not for their partner (mean difference = −0.235, $P = 0.308$). Moreover, we found a negative relationship between age and fear of the prospect of death, both for participants' own death (r_s = –.299, $P < 0.001$) and their partner's death (r_s = −.208, $P = 0.010$).

Discussion

This study sheds new light on the surrogate decision process, including surrogates' propensity to decide according to their predictions of the recipient's preferences. We show that previous discussions between partners increase their confidence that they are making the right decision.[a] This suggests that encouraging people to have discussions earlier about end-of-life preferences would ease the decision process. We also found that surrogates who had been in a relationship for longer were more likely to conform to the substituted judgment standard. They were more likely to have had discussions about end of life, but we did not find that these increased surrogates' likelihood of deciding according to their predictions of the recipient's preferences. Although discussions can relieve the burden experienced by surrogate decision makers, they might not successfully reduce surrogate inaccuracy.

As expected, age had an effect on experiences and individual differences relating to mortality: older adults were more frequently exposed to experiences of illness and death and were more likely to fear the prospect of their own and their partner's death. Age also had an effect on the process of making a surrogate decision: older adults were more likely to have discussions about end of life with their partners, which can be attributed to their previous experiences of illness and death. Notably, having prior discussions increased surrogates' knowledge of their partner's wishes and their confidence that, from their perspective, they were making the right decision. These findings shed light on the process of making a surrogate decision, which seems to be eased by having these prior discussions and feeling like one knows the recipient's wishes. Crucially, this shows that participants hold a conception of the right decision as being related to making a decision in line with the substituted judgment standard. This lends support to its validity as an ethical framework.

The finding that participants who were older and had been in a relationship for longer were more likely to decide based on their surrogate predictions for their partner lends support to Tunney and Ziegler's model.[3] Indeed, it predicts that surrogates who are more familiar with the recipient are more likely to take a simulated perspective as they believe it would match the recipient's preferences. This is an encouraging result as these demographic groups are more likely to find themselves having to make a surrogate decision for their partner. However,

[a]We asked participants whether they were confident that they made the right decision, without giving them an indication of what the "right" decision might refer to. The conclusions we draw about making the right decision are solely from the subjective perspective of the participant. We do not put forward a position on what might be the "right" decision here.

we did not find that surrogates' previous discussions with their partner or knowledge of their partner's preferences increased the likelihood of a simulated decision. This is consistent with the finding that surrogates having prior discussions with their next-of-kin does not increase surrogate accuracy.[2] This means that although prior discussions and increased knowledge might be helpful from the point of view of the decision maker, they might not be the best way to improve the accuracy of surrogate decisions.

Participants were more likely to accept a life-saving treatment, at the risk of impaired quality of life, for their partner than for themselves. Interestingly, this was despite the fact that surrogates predicted their partner's decisions to be similar to their own. On the other hand, we did find that surrogate predictions were predictive of surrogate decisions, even after controlling for participant's own choices. It seems to be the case that surrogates do engage in a simulated perspective and take into account the recipient's wishes, which moderates the statement that surrogates do not follow the substituted judgment standard. Furthermore, we found new evidence relating to the self-other difference. Participants who were more confident that they made the right decision for their partner showed smaller self-other differences—they were less likely to accept more treatment for their partner than for themselves. This could mean that surrogates believe the wrong decision would be to accept more treatment for their partner than themselves to keep that person alive, which is coherent with the idea that the right decision is one that conforms to the substituted judgment standard, according to our participants.

Contrary to our expectations, we did not find that any of our measures related to mortality had an effect on participants' propensity to accept life-saving treatment, neither for themselves nor for their partner. This is consistent with Batteux et al.,[13] who found that surrogates reported similar wishes and decision processes despite large variabilities in their propensity to accept life-saving treatment. More research is therefore needed to understand this variability. There are also many aspects of the experience and acceptance of mortality that we did not investigate here, such as how participants reflected on these life events. Exploring these individual differences in more detail might help elucidate the relationship between age and the likelihood of conforming to the substituted judgment standard.

Our findings are consistent with previous qualitative reports that show that discussions and knowledge of the patient's wishes helped them throughout the process.[14–16] Surrogates do worry about whether they have made the right decision after the fact,[23] thereby reinforcing the need for encouraging discussions in light of our findings. Discussions beyond the surrogate-recipient dyad could also help alleviate conflicts between family members, particularly when the family's wishes prevent the surrogate from respecting the patient's wishes.[23] However, other measures could also be put in place that might be easier than altering the communication patterns of all potential surrogates. Recommendations have been made about how clinicians can ease the process. Clinicians who are informative, available for communication, and supportive of surrogates' decisions have been found to alleviate the burden experienced by surrogates, which seems to put them in a better position to make a decision that they think is right.[23] Care providers could also be a valuable resource before the fact, by encouraging and facilitating discussions between patients at risk of losing their decision-making capacity and their family members.

Conclusions and Future Directions

The present study shows that previous discussions between surrogates and the recipient should ease the process of making a surrogate decision and give surrogates more confidence that they are making the right decision but do not increase the likelihood of making a simulated decision and thereby conforming to the substituted judgment standard. Nevertheless, interventions that are designed to foster these discussions between family members would still be useful to relieve the burden placed on the decision maker, particularly for those without previous experiences of illness and death and are therefore less likely to have these discussions. It seems to be the case that older surrogates are more inclined to decide based on their partner's wishes, although we were not able to disentangle whether this was an effect of age or length of relationship. This would be a fruitful avenue for future research given that older adult partners are far from being the only kind of surrogate-recipient relationship. Indeed, surrogate decisions are often made by adult children of the recipient,[16] meaning that we need to investigate whether our findings are affected by the nature of the surrogate-recipient relationship. For example, partners might prioritize honoring each other's wishes, whereas adult children might be drawn to the issue of care when deciding for their parents. If this is the case, discussions would be a more effective way to ease the process in the former than the latter. Finally, although we were not able to measure surrogate accuracy, it is a necessary step to examining the applicability of the substituted judgment standard. It would be useful to assess how the likelihood of making a simulated decision

affects surrogate accuracy and whether the factors we identified here influence that relationship.

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Data Availability

The data collected and analyzed in this study can be accessed upon request from the corresponding author.

Supplemental Material

Supplementary material for this article is available on the *Medical Decision Making* Web site at http://journals.sagepub.com/home/mdm.

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Supplementary File 1 – Materials

1. WALT instrument

Decisions for the self

Functional impairment. Think about your current state of health. Now imagine that you are suddenly sick with an illness that requires you to be in the hospital for weeks to months. In the hospital, you are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. You also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, you would be in a state where you would be bedbound. You would not be able to get up out of bed to the bathroom by yourself, and you would need help with all of your daily activities. Without the treatment, you will not survive. The doctor tells you there is a X% chance that the treatment will work and get you back to your current state of health and a X% chance that it will not work and you will be bedbound. Do you want the treatment?

Cognitive impairment. Think about your current state of health. Now imagine that you are suddenly sick with an illness that requires you to be in the hospital for weeks to months. In the hospital, you are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. You also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, you would be in a state where your mind would not be working, such that you would not be aware of what was going on around you or be able to recognize your loved ones. Without the treatment, you will not survive. The doctor tells you there is a X% chance that the treatment will work and get you back to your current state of health and a X% chance that it will not work and you will be unaware. Do you want the treatment?

Decisions for partner

Functional impairment. Think about your partner's current state of health. Now imagine that they are suddenly sick with an illness that requires them to be in the hospital for weeks to months. In the hospital, they are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. They also need major therapies such

as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, they would be in a state where they would be bedbound. They would not be able to get up out of bed to the bathroom by themselves, and they would need help with all of their daily activities. Without the treatment, they will not survive. The doctor tells you there is a X% chance that the treatment will work and get your partner back to their current state of health and a X% chance that it will not work and your partner will be bedbound. Would you choose the treatment for them?

Cognitive impairment. Think about your partner's current state of health. Now imagine that they are suddenly sick with an illness that requires them to be in the hospital for weeks to months. In the hospital, they are offered treatment. The treatment includes many minor tests, such as x-rays, blood draws and CT scans. They also need major therapies such as being in the intensive care unit, receiving surgery, or having a breathing machine. Now imagine that at the end of the treatment, they would be in a state where their mind would not be working, such that they would not be aware of what was going on around them or be able to recognize their loved ones. Without the treatment, they will not survive. The doctor tells you there is a X% chance that the treatment will work and get your partner back to their current state of health and a X% chance that it will not work and your partner will be unaware. Would you choose the treatment for them?

2. Questionnaires

Decision process (scale from 1-5)

- How confident are you that you made the right decisions for yourself?
- How confident are you that you made the right decisions for your partner?
- Do you feel like you know your partner's wishes when it comes to these scenarios?
- To what extent have you previously discussed end-of-life scenarios (similar to the ones you were presented with today) with your partner?

Fear of death scale (scale from 1-5)

How disturbed or anxious are you by the following aspects of your own death and dying?

- The shortness of life
- Missing out on so much after you die
- Dying young

- The physical degeneration involved
- The pain involved in dying
- The intellectual degeneration of old age
- The uncertainty as to how bravely you will face the process of dying
- Your lack of control over the process of dying
- Leaving the people close to you behind
- The uncertainty of not knowing what happens after death

How disturbed or anxious are you by the following aspects of your partner's death and dying?

- Losing someone close to you
- Never being able to communicate with the person again
- Regret over not being nicer to the person when they were alive
- Growing old alone without the person
- Feeling lonely without the person
- Having to be with someone who is dying
- Watching the person suffer from pain
- Seeing the physical degeneration of the person's body
- Not knowing what to do about your grief at losing the person
- Watching the deterioration of the person's mental abilities

Life experience checklist (yes/no answer)

Now we are going to ask you some questions about events in your life that are frightening, upsetting, or stressful to most people. Please think back over your whole life when you answer these questions. Some of these questions may be about upsetting events you don't usually talk about. Your answers are important, but you do not have to answer any questions that you do not want to. Thank you.

- Have you ever had a very serious accident or accident-related injury (for example, a bad car wreck or an on-the-job accident)?
- Have you ever had a very serious physical or mental illness (for example, cancer, heart attack, serious operation, felt like killing yourself, hospitalised because of nerve problems)?

- Has a very serious accident or accident-related injury (for example, a bad car wreck or an on-the-job accident) ever happened to someone close to you so that even though you didn't experience it yourself, you were affected by it?
- Has a serious physical or mental illness (for example, cancer, heart attack, serious operation, felt like killing yourself, hospitalised because of nerve problems) ever happened to someone close to you so that even though you didn't experience it yourself, you were affected by it?
- Have you ever been responsible for taking care of someone close to you who had a severe physical or mental handicap (for example, cancer, stroke, AIDS, nerve problems, can't hear, see, walk)?
- Has someone close to you died suddenly or unexpectedly (for example, sudden heart attack, murder or suicide)?
- Has someone close to you died (do NOT include those who died suddenly or unexpectedly)?

Supplementary File 2 – Full results of the mediation analyses

Hypothesis 2c. The mediation analysis (model 6) with age as IV and self as DV, with experiences and fear of own death as mediator variables, was not significant. The total effect of age on self was not significant (*B*=0.149, *SE*=0.107, *p*=.164). The direct effect of age on experiences was significant (*B*=0.017, *SE*=0.005, *p*=.002) and accounted for 6.48% of the variance in experiences. The direct effects of age (*B*=-0.029, *SE*=0.033, *p*=.375) and experiences (*B*=-0.686, *SE*=0.485, *p*=.159) on fear of own death were not significant ($F_{2,150}$=1.838, *p*=.163). The direct effects of age (*B*=0.141, *SE*=0.112, *p*=.208), experiences (*B*=0.213, *SE*=1.66, *p*=.898) and fear of own death (*B*=-0.113, *SE*=0.278, *p*=.686) on self were not significant ($F_{3,149}$=0.708, *p*=.579). The indirect effect of age on self was not significant through experiences (effect=0.004 [-0.054, 0.077]) or fear of own death (effect=0.003 [-0.020, 0.039]) or experiences and fear of own death (effect=0.001 [-0.009, 0.012]).

Hypothesis 2d. The mediation analysis (model 6) with age as IV and partner as DV, with experiences and fear of partner's death as mediator variables, was not significant. The total effect of age on partner was not significant (*B*=0.084, *SE*=0.118, *p*=.477). The direct effect of age on experiences was significant (*B*=0.017, *SE*=0.005, *p*=.002) and accounted for 6.48% of the variance in experiences. The direct effects of age (*B*=-0.046, *SE*=0.024, *p*=.056) and experiences (*B*=-0.202, *SE*=0.356, *p*=.573) on fear of partner's death were not significant ($F_{2,150}$=2.443, *p*=.090). The direct effects of age (*B*=0.040, *SE*=0.124, *p*=.747), experiences (*B*=0.930, *SE*=1.82, *p*=.609) and fear of partner's death (*B*=-0.572, *SE*=0.415, *p*=.170) on partner were not significant ($F_{3,149}$=0.913, *p*=.436). The indirect effect of age on partner was not significant through experiences (effect=0.044 [-0.040, 0.149]) or fear of partner's death

(effect=0.016 [-0.054, 0.094]) or experiences and fear of partner's death (effect=0.002 [-0.008, 0.013]).

Hypothesis 3b. The mediation analysis (model 6) with age as IV and simulation as DV, with discussions, knowledge and confidence as mediator variables, was not significant. The total effect of age on simulation was significant (*B*=0.098, *SE*=0.046, *p*=.035) and accounted for 2.92% of the variance. The direct effect of age on discussions was significant (*B*=0.011, *SE*=0.038, *p*=.006) and accounted for 4.94% of the variance in discussions. The direct effect of age on knowledge was not significant (*B*=-0.002, *SE*=0.003, *p*=.599) but discussions were (*B*=0.453, *SE*=0.070, *p*<.001); together they accounted for 22.2% of the variance in knowledge ($F_{2,150}$=21.427, *p*<.001). The direct effects of age (*B*=0.003, *SE*=0.003, *p*=.400) and discussions (*B*=0.085, *SE*=0.074, *p*=.251) on confidence were not significant, but knowledge was (*B*=0.402, *SE*=0.076, *p*<.001); together they accounted for 24.1% of the variance in confidence ($F_{3,149}$=15.787, *p*<.001). The direct effect of age on simulation was significant (*B*=0.096, *SE*=0.047, *p*=.042), but the direct effects of discussions (*B*=-0.993, *SE*=1.106, *p*=.370), knowledge (*B*=1.159, *SE*=1.123, *p*=.350) and confidence (*B*=1.826, *SE*=1.225, *p*=.138) were not significant; together they accounted for 6.10% of the variance in simulation ($F_{4,148}$=2.403, *p*=.052). The indirect effect of age on simulation through discussions, knowledge and confidence was not significant (effect=0.004 [-0.002, 0.013]) and neither were any of the other indirect effects.

Hypothesis 4. The mediation analysis (model 6) with length of relationship as the IV and simulation as the DV, with discussions, knowledge and confidence as mediators was not significant. The total effect of length of relationship on simulation was significant (*B*=0.127, *SE*=0.053, *p*=.017) and accounted for 3.71% of the variance. The direct effect of length of relationship on discussions was significant (*B*=0.011, *SE*=0.004, *p*=.011) and accounted for 4.25% of the variance in discussions. The direct effect of length of relationship on knowledge

was not significant (*B*=-0.001, *SE*=0.004, *p*=.722) but discussions were (*B*=0.450, *SE*=0.070, *p*<.001); together they accounted for 22.14% of the variance in knowledge ($F_{2,150}$=21.33, *p*<.001). The direct effects of length of relationship (*B*=0.002, *SE*=0.004, *p*=.661) and discussions (*B*=0.092, *SE*=0.073, *p*=.213) on confidence were not significant, but knowledge was (*B*=0.400, *SE*=0.076, *p*<.001); together they accounted for 23.86% of the variance in confidence ($F_{3,149}$=15.560, *p*<.001). The direct effect of length of relationship on simulation was significant (*B*=0.127, *SE*=0.054, *p*=.019), but the direct effects of discussions (*B*=-1.017, *SE*=1.097, *p*=.355), knowledge (*B*=1.109, *SE*=1.130, *p*=.369) and confidence (*B*=1.895, *SE*=1.217, *p*=.121) were not significant; together they accounted for 6.96% of the variance in simulation ($F_{4,148}$=2.768, *p*=.029). The indirect effect of length of relationship on simulation through discussions, knowledge and confidence was not significant (effect=0.004 [-0.002, 0.015]) and neither were any of the other indirect effects.

Chapter 2: Discussion

Surrogate decision-making is neither easy to do, nor is it easy to explain, particularly when risk is involved. Nevertheless, the research presented in this thesis has strengthened our understanding of surrogate risk preferences. In this final chapter, I present an overview of my findings to clarify how they have advanced the field and which questions remain unanswered. I will then discuss their theoretical, practical and methodological implications before advising on future directions. Finally, I will draw conclusions concerning my work and the ways it can shape further research.

2.1. Overview and discussion of findings

2.1.1. Decision outcome

As expected, the differences between the decisions we make for ourselves and the decisions we make for others vary by decision domain. In the medical domain, I consistently found that participants are more risk-averse for someone else than for themselves. The meta-analysis in Paper 1 showed that this finding is consistent across the literature. I was able to replicate this in Studies 2, 3 and 4 although I did not find self-other differences when the outcome was relatively trivial. Crucially, I explain in Chapter 4 that surrogates are drawn to the option which carries the lower risk of death, more so than when deciding for themselves. This effect was replicated in Studies 5 and 6, where participants were more likely to accept a life-saving treatment for their partner than themselves, even when this carried the risk of impairing their quality of life. This hypothesis has also been confirmed in recent research (Von Gunten & Scherer, 2018).

In the financial domain, I presented a more diverse set of findings, which the meta-analysis was able to shed light on. I found that the frame in which the decision is presented

affects whether and how self-other differences manifest themselves. Across the literature (Paper 1), people are more risk-seeking for others in decisions over gains, but more risk-averse for others in decisions over losses. In cases where the decision is presented as a gain but with a potential loss, there seem to be no self-other differences. Findings in Papers 2 and 3 partially support this – some of my findings are consistent with this (Experiments 1 and 2 in Paper 2 and Experiment 1 in Paper 3), but others are not (Experiments 1 and 2 in Paper 2 and Experiment 3 in Paper 3). When I found self-other differences, these were over gains but not losses, which I have not been able to clearly explain. Nevertheless, I have been able to partially explain why inconsistencies in the literature have arisen. Interestingly, I also found an effect of frame in the medical domain, but which was slightly different. Self-other differences were weaker in a gain frame than in a loss frame, but were still in the same direction (i.e. more risk-averse for others).

Why do the medical and financial domains present conflicting self-other differences? My hypothesis was that the difference in findings in the literature were due to crucial differences in the scenarios that had been studied. Indeed, studies in the financial domain had used rather small and inconsequential decisions, whereas studies in the medical domain concerned more important and often life-changing decisions. I tested this hypothesis in Paper 2 which varied the significance of the decision. I did find that either self-other differences only appeared with large outcomes, or that self-other differences with small outcomes were magnified with large outcomes. Understanding this effect is something that I chose not to pursue, but it would be worthwhile to do so in the future. However, I still found a differing effect of frame in both domains – self-other differences arose in a gain frame for financial decisions and in a loss frame for medical decisions. I did not find the predicted reduction in risk-taking for others with large outcomes, meaning that the significance of the decision alone cannot account for domain differences.

It is likely that there are different social values attached to risk-taking in each domain, which would then lead to conflicting self-other differences, as predicted by social values theory (Stone & Allgaier, 2008). As I discussed in Paper 2, it could be that decision-makers experience different levels of accountability when making financial as opposed to medical decisions. Financial professionals are less likely to be held accountable for their decisions than medical professionals are, which might then translate to how participants make decisions across my studies. I did find some evidence that thinking about accountability can lead participants to be more cautious when making medical decisions for others, albeit relatively weak (Paper 4). More work is needed to evaluate its role in ordinary decision-makers, particularly in the financial domain. There is indeed evidence that thinking about accountability reduces risk-taking for others in a financial setting (Pollmann et al., 2014).

2.1.2. Decision process

My findings concerning decision outcomes can tell us something about the decision process. In the financial domain, the effect of frame that I report across the literature in Paper 1 is in line with the risk-as-feelings hypothesis. This lends support to an emotional account of self-other differences by suggesting that, when making a surrogate decision, the decision-maker's emotional reactions to the risk are reduced given the empathy gap between them and the recipient. In the medical domain, the reduction in risk-taking for others that I found across studies for important decisions aligns with the responsibility and accountability hypotheses. This lends support to a social account of self-other differences whereby the decision-maker chooses to minimise the risk of the most negative outcome to avoid either harming the recipient or making a choice that is difficult to defend.

In Paper 3, I was able to go beyond looking at decision outcomes and explore the relationship between surrogate predictions and decisions. Although I found discrepancies in

their outcomes, surrogate predictions were predictive of surrogate decisions, independently of decisions made for the self. This implies that participants are influenced by their perception of the recipient's preferences when making decisions on their behalf. This was the case in both financial and medical decisions, although the relationship was stronger in medical decisions[2]. I found an even stronger relationship between predictions and decisions when surrogates made end-of-life decisions for their partner in Paper 6. This makes sense as surrogates are more likely to know their partner's than a stranger's preferences. This was in line with the qualitative analysis in Paper 5 which showed that surrogates largely intend to make decisions in accordance with their partner's wishes in these scenarios. Additionally, I found that older age and longer relationships lead to a stronger relationship between surrogate predictions and decisions in Paper 6. This again makes sense given that one would expect this relationship to strengthen as the decision-maker becomes more familiar with the recipient's wishes.

Having said that, I did find a mismatch between the decisions participants made for their partner and the ones that their partner made for themselves in Paper 5, indicating a degree of surrogate inaccuracy. This shows that they are not necessarily able to accurately predict their partner's wishes. Interestingly, there seemed to be larger differences between partners' risk preferences than their preferences towards the particular health states. The inaccuracy I observed could be attributable to surrogates mis-predicting their partner's risk preference rather than their treatment preferences. It could also be due to surrogates taking other factors into account when making their decisions. Indeed, they spoke of several factors that can explain why they accepted more treatment for their partner than for themselves. As one would expect,

[2] We did not pursue an investigation of financial decisions further than this. At this point, we felt that we had been able to address the questions we had set out to and filled the gaps we had identified. There was of course a lot more work that could have been undertaken, but we chose to move on to examining the medical decision process in more depth. However, the financial literature would benefit from pursuing a similar level of depth to understanding the process of making surrogate financial decisions.

they did not want their partner to die, but they also felt that they should give them a fighting chance, particularly given the responsibility placed on them.

In Paper 6, I wanted to gain a better understanding of what influences the likelihood of surrogates deciding based on their surrogate predictions for their partner. Although I found that age and length of relationship were the only predictors, I did uncover other interesting findings. Firstly, I confirmed that prior discussions between the surrogate and the recipient makes them more confident that they were making the right decision. This indicates that discussions can ease the decision process. Secondly, I did not find that participants' fear of mortality influenced how much risk of a negative outcome they were prepared to take when accepting a life-saving treatment, either for themselves or their partner. Participants' propensity to accept treatment might in fact be reflective of their risk preference rather than their preferences towards the outcome. Future work should aim to uncover why people can have such diverging risk preferences in these scenarios, particularly if this can increase surrogate accuracy.

2.2. Theoretical implications

2.2.1. Previous theories of surrogate decision making

Across studies, I found evidence both for and against psychological theories of surrogate decision-making. In the meta-analysis (Paper 1), I did not find that the psychological distance between the decision-maker and the recipient had an effect on risk-taking, neither across all domains nor in the financial domain. However, I did find an effect of psychological distance in the medical domain, but not in the predicted direction. Decisions were less risk-taking for others than the self, but even less so for a close other as opposed to a distant other. These findings do not support the predictions made based on construal-level theory (Trope & Liberman, 2010b), the egocentric anchoring and adjustment model (Epley et al., 2004) and the empathy gap (Loewenstein, 1996). Nonetheless, the empathy gap can explain findings from

the medical domain in a different way. It could be that participants felt more emotionally involved in important medical decisions made on behalf of a close other than themselves, which led them to reduce their risk-taking further. Either way, the way in which the identity of the recipient affects surrogate decisions is not as clear as predicted by these theories. However, they were not originally intended to explain surrogate decision-making, but have been adapted to do so in the field. Any contradicting evidence does not necessarily weaken the theories themselves, but prevents their applicability to surrogate decision-making.

In terms of theories that are more specific to the field, I found support for both the risk-as-feelings hypothesis (Loewenstein et al., 2001) and social values theory (Stone & Allgaier, 2008). Paper 1 showed that findings in the financial domain were in line with the risk-as-feelings hypothesis as the effect of frame was concurrent with its predictions. However, I did not find the same effect in the medical domain, where it seems that there is a strong norm towards avoiding a risk of harm for others. This norm could be a social value as conceptualised by social values theory, which perhaps overrides the effect predicted by the risk-as-feelings hypothesis. Finally, I found support for the responsibility hypothesis in the medical domain where decision-makers were more cautious for others than themselves. On the other hand, I did not find an overarching tendency for reduced risk-taking for others in the financial domain.

As I had anticipated, none of these theories can account for the complexity of surrogate decisions on their own. Even taken together, they present quite a simplistic picture of a process that I have shown to be far more intricate in Studies 5 and 6. Although in particular cases they might explain self-other differences, they cannot tell us much beyond that. Ultimately, what I am interested in is surrogate decisions rather than self-other differences. Self-other differences are a way of getting closer to understanding surrogate decisions, but they are an incomplete picture. I will now turn to evaluating Tunney and Ziegler's (2015) model in light of my findings.

2.2.2. Tunney and Ziegler's (2015) model

My findings lend support to the idea that surrogates engage in the forms of perspective-taking predicted by Tunney and Ziegler's (2015) model. In Paper 3, I found that both participants' own decisions and their surrogate predictions were predictive of their surrogate choices. This suggests that they are engaging in both projected and simulated perspective-taking (although it could also be that they are the product of a common underlying factor). In my qualitative analysis in Paper 5, I was able to understand their thought process in a lot more depth and found evidence that they were engaging in all four forms of perspective-taking. They reported having to weigh up what their partner would want (simulated), what they wanted for their partner (egocentric) and what was in their partner's best interest (benevolent). They also relied on their own perspective (projected), particularly when they were uncertain about their partner's wishes. This supports the forms of perspective-taking described by the model, although this paper did not show how surrogates struck the balance between them. The predictions made in terms of the weight attributed to each perspective still require investigation.

I have also identified how the biasing factors described in the model can influence the decision process. In Paper 5, a large proportion of participants intended to make a simulated decision and spoke at length about how they incorporated their partner's wishes in their decision-making. Future work could look at how their intention of making a simulated decision influences their propensity to align their surrogate decisions with their surrogate predictions, and in turn how this affects surrogate accuracy. In terms of calibration, the model expects that surrogates who are better calibrated with their recipient are more likely to make a simulated decision for them. Indeed, I found a stronger relationship between predictions and decisions in Paper 6 than in Paper 3 – when surrogates made decisions for their partner as opposed to a stranger. These predictions concerning psychological distance are different to those made by

other theories, which I did not find support for in Paper 1. I did not investigate individual differences in empathy so cannot speak to whether the model's predictions regarding empathy are supported.

I was able to draw some conclusions about the significance of the decision. In Studies 2, 3 and 4, I found self-other differences for severe but not moderate illnesses. The model expects surrogates to put more elaborate thought into more significant decisions, which perhaps led them to be more cautious for others in those scenarios. From my qualitative analysis in Paper 5, it seems that a different level of deliberation went into each scenario. The more severe the negative outcome could be, the more they seemed to deliberate and struggle to decide. In the financial domain, in Paper 2 I found self-other differences for either real or large outcomes, but not small hypothetical outcomes. Again, this shows that more significant outcomes are more likely to lead to self-other differences. This perhaps indicates that surrogates put more thought in the decision process and are less likely to rely on a projected perspective, a hypothesis that would benefit from being tested. Finally, I found some evidence for the fact that accountability increases caution for others in the medical domain. In Paper 4 I did not find that ordinary decision-makers focused on the legal repercussions of their decisions, unlike medical professionals. However, those who did further reduced their risk-taking for others relative to themselves. In Studies 4 and 5, I found evidence that surrogates think about the consequences of their decision for the recipient's family, which could imply that they fear being held accountable by the family. Indeed, surrogates expressed that the responsibility placed on them played a part in pushing them to accept a life-saving treatment for their partner more so than for themselves.

There are factors that have not been incorporated into the model which warrant attention. The model incorporates particular features of the decision-maker, their relationship to the recipient and the content of the decision. On the other hand, it does not go beyond the

exchange between the surrogate and the recipient to consider the wider effect of people external to the dyad. Firstly, the influence others can have on the decision process is not acknowledged. Surrogate decisions can happen in a more complex social context where the decision-maker and the surrogate are not as easily identifiable, or where other people weigh into the decision process. This is the case in a lot of medical decisions where other family members and medical professionals have a significant role to play, but also in decisions made within organisations where the decision responsibility might be diffused and its consequences affect a large number of people. Moreover, social values and expectations held by the decision-maker are likely to influence the decision process, as predicted by social values theory (Stone & Allgaier, 2008). Whether they might constitute an additional biasing factor or a different perspective altogether in the model is something to consider. Some social values might favour a particular perspective, thereby acting as a biasing factor, but it might also be the case that considering what the majority would do or expect of you is another perspective a surrogate considers when making a decision. Secondly, the impact a decision can have on other people than the recipient is likely to be considered by the decision-maker. This was clear in Studies 4 and 5 where participants thought about the consequences of accepting a risky treatment on behalf of the recipient for their family. Reflecting on how their decision impacts others beyond the recipient could constitute another perspective a surrogate might take.

Tunney and Ziegler's (2015) model is able to account for many of the processes involved in making a surrogate decision. Interpreting surrogate decisions within its framework is relatively straightforward, as can be seen from the qualitative analysis in Paper 5. However, as it incorporates so many factors, it is difficult to predict exactly which perspective a surrogate might heavily weight or emphasise in a given situation. The model can often make several predictions per situation, which compromises its precision. Interpreting one's findings according to the model retrospectively is more straightforward than making clear predictions

beforehand. The advantage of the model is that it is domain-general and adaptable to many decision contexts, which means that it is able to capture the complexity of surrogate decisions. However, it becomes difficult to falsify if it cannot always make specific predictions, making its validity challenging to assess. The trade-off between simplifying surrogate decisions to design a straightforward theory and acknowledging their complexity to avoid a reductionist one is difficult to resolve. Perhaps incorporating social values into the model would allow for more fine-tuned predictions according to each decision domain, but that runs the risk of resulting in a domain-general model which is simply a collection of domain-specific theories. Nevertheless, the model remains a very useful framework to understand the surrogate decision process and makes a number of testable predictions which are worth investigating.

2.3. Methodological implications

2.3.1. Between vs within subjects

A potential caveat to these studies is that they always compared self and other using a within-subjects design. There were a number of reasons for this. Firstly, for consistency. Given that I started with a within-subjects design, I continued doing so to compare studies without worrying about different designs as a potential explanation for conflicting results. Secondly, some of my research questions could only be answered using a within-subjects design, as in Paper 3 where I investigated the relationship between self-other differences in predictions and decisions. It was also valuable to do so in Paper 5 to be able to ask participants to compare their surrogate decisions to their own decisions during the interview. Overall, I believe that using a within-subjects design was a preferable choice as it allowed for more in-depth analyses, although I need to identify in what way that may have impacted these results. The meta-analysis in Paper 1 did not find differences between within and between subject designs, neither across all studies nor in the financial domain. However, I did find that this was the case in the medical

domain, where I found stronger self-other differences with within-subject designs. This supports the idea that participants are comparing self to other in a within-subjects design which then results in larger differences. Nevertheless, the direction of the effect does not change in a between-subjects design, meaning that the conclusions of my studies are not invalidated by their design.

2.3.2. Self vs other

Throughout these studies, I chose to investigate surrogate decision-making by comparing the decisions we make for ourselves to those we make for others, as does the field. This has been a valuable starting point, which enabled me to draw from the extensive body of work on decision-making and infer conclusions about how it is affected by taking another's perspective. On the other hand, this has led the field down a particular path which leaves one wondering how useful it is to understand the surrogate decision process. Although the research question of many previous studies has been to compare self and other decisions, my research question has been more specific to surrogate decisions themselves, as is Tunney and Ziegler's (2015) model. There is quite a leap to be made from figuring out whether we take more or less risk for others in a given situation to uncovering how surrogate decisions are made. This could be the reason why my studies which have gone beyond comparing self and other (Studies 3, 5 and 6) have produced the most interesting and novel findings. Perhaps the fact that comparing self and other decisions has produced such conflicting results is indicative of the limits of that research question.

Another problem with comparing self and other is that it introduces the assumption that the two are distinct. Partners for example might perceive their partner as a part of themselves and will therefore not draw a clear distinction between the two, as was often apparent during the interviews in Paper 5. Although in a way, this issue is captured by the concept of

psychological distance which does encapsulate the idea that self and other can have varying degrees of separation. The fact that I acknowledge the identity of the recipient throughout my work implies that I have already accounted for this. Relatedly, theories of surrogate decision-making do themselves assume that surrogate decisions are based on people's own decisions. Incorporating a projected perspective in one's decision-making means that surrogate decisions are not thought of separately from our own decisions. Again, the fact that I acknowledge this throughout shows that I do not necessarily assume as clear a distinction between self and other as my design choice might suggest.

Comparing self and other also has its limitations with respect to ecological validity. There are a limited number of real-world scenarios in which an individual could be asked to consider the same decisions for themselves and then again for somebody else. Take a situation where an individual A develops a severe medical condition and has to make treatment decisions for themselves. It would be extremely unlikely for their partner, individual B, to also develop the same medical condition, but this time the treatment decision is a surrogate one made by individual A. Similarly, the future generation of parents who have to make vaccination decisions for their children will probably not have to do so for themselves as they are likely to have already been vaccinated in the past. However, if one is to take the self vs other comparison less literally, its value does become apparent, as was clear in Paper 5. Older adults are confronted with the question of end-of-life treatment and are likely to have considered these decisions for themselves as well as for someone else. They might have encountered such a situation with one of their family members, which lead them to think about their own treatment preferences and drafting advance directives. In some cases, comparing self and other makes sense in light of real-world circumstances.

2.3.3. Real vs hypothetical decisions

All of my studies were conducted in a laboratory or online setting. Although a few were financial studies where the outcomes were converted to participant payments, these decisions were still stripped of context and might not be representative of the kinds of financial decisions that are made outside of the laboratory. This is a well-known, longstanding issue in experimental research which I do not wish to dwell on here. However, the issue is magnified in cases where the research question seeks to explain a real-world phenomenon above and beyond a psychological process. All research questions seek to explain real-world phenomena, although some do so in a more considerate way than others. Those that explicitly seek to address real-world phenomena will encounter more limitations when using laboratory research.

As the research reported in this thesis has developed, the questions tackled have been more inquisitive of real-world phenomena, but the methods used to answer them have varied in suitability. By seeking to examine the effect of accountability on medical decision-making, Paper 4 posed a number of questions regarding the complex social embeddedness of surrogate decisions which were not adapted to a laboratory setting. Although some insights were gained from it, there was so much more about accountability that remained to be uncovered. The subsequent choice of mixed methods for Paper 5 helped to alleviate these methodological limitations by opening up my work to a wealth of information I could not have gained otherwise. What this enabled me to do was address the issue of hypotheticality by letting participants discuss how the decisions they had made in the laboratory might compare to what they would expect to happen if these decisions were to occur outside of it. My findings showed that the difficulties and conflicts participants reported while making their decisions would be exacerbated in real life, as suggested by their own reflections and previous studies investigating real-world surrogate decision-making (Schenker et al., 2012). This was a nice way of addressing the issue, rather than silencing it in the way that laboratory studies can do.

Although I have gained from altering my methodology, this is not sufficient to understand real-world phenomena. The decisions I presented to participants were still heavily stripped of context, which is the case of the field as a whole when examining decision outcomes. This does have a number of implications that cannot be neglected. A striking example is the disconnect between the debate regarding decision domain in the field and the real-world equivalents of these decisions. The field has interrogated whether self-other differences are comparable across domains. Some have assumed that they are and speak about findings in each domain interchangeably (Polman, 2012b). Others have conjectured that if you can account for other variables which manifest themselves differently across each domain you can eventually do so (Stone, Choi, de Bruin, & Mandel, 2013). The latter is the approach I took in Paper 2 where I tested whether the significance of the decision could explain domain differences in self-other differences.

The disconnect with the real-world is that the contexts in which medical decisions are made are unlikely to be identical to the contexts in which financial decisions are made, even after controlling for various factors. The wider historical, political, cultural and social context associated to each domain makes them very different from one another. For example, it is conceivable that the last financial crisis altered the way people think about financial decisions and that the current NHS crisis is changing the way people perceive medical treatments[3] (Campbell, 2018). The decisions that people face in those domains are bound to carry the weight of their context (which is also likely to transfer to the laboratory). Concluding that medical and financial decisions which have similar features (such as risk and magnitude) are made in the same way neglects the possibility that these decisions are more than the sum of their parts. Although social values theory (Stone & Allgaier, 2008) acknowledges the role of

[3] The care delivered by the NHS and the cost of treatment to the NHS were in fact mentioned on several occasions during interviews in Paper 5.

the social context, reducing this to a social value which they consider to be what the majority thinks is acceptable is still an oversimplification.

Laboratory studies seem to attribute more importance to the features of a decision in trying to explain surrogate decisions, but there is a whole host of other factors that are likely to come into play that are not captured by those studies. Consequently, they run the risk of not being able to adapt their findings to a context where individuals do not necessarily think of decisions in terms of their features.

2.3.4. Qualitative vs quantitative methods

At the outset of this thesis, I did not expect to analyse anything other than quantitative data collected via laboratory experiments. However, as I became more interested in the decision process, I decided to turn to qualitative methods to address its complexity. Their use opened up a number of possibilities that I had not previously envisaged. It provided useful insight into how participants were approaching the decision task, as a form of validation procedure, but also how participants expect it to compare to a real scenario. It allowed me to question my own conjectures concerning the decision process and formulate new hypotheses which I tested in Paper 6. These were entirely derived from the qualitative data in Paper 5 and would not have been formulated otherwise. This shows the value of drawing from participants' own thoughts and experiences when designing studies, which is often richer and more detailed than the data one might get from small quantitative studies. My use of mixed methods was unusual for decision research and allowed me to bring together the experimental perspective and the qualitative perspective.

Other than being a useful tool, qualitative methods allow a phenomenon to be seen in a different light to quantitative methods. They allow for participants' own understanding of the decision process to be investigated, rather than the researchers' preconceptions of it. In a semi-

structured interview, the questions are conceived by the researcher but guided by and adapted to the participant, who is able to freely formulate their answers. The researcher's own perspective does appear through their interpretation of the data, but it is usually constructed from the data itself. In a quantitative study, the questions are conceived by the researcher, who then clearly defines the ways in which they can be answered and expects participants to fit their own answer into the researcher's framework. This is difficult for the participant whose answer may be misunderstood when made to conform to pre-established options. It also leaves little room for the participant to flag these issues and potential misunderstandings. From this, the researcher is able to test their hypotheses but not challenge the assumptions that underpin them. Qualitative methods on the other hand allow a lot more space for reflection for both the participant and the researcher. This is particularly important to capture the practical implications of a study, where the reality of the participants is ultimately what will matter as the implications affect them, not the researcher.

Comparing qualitative to quantitative methods becomes more complicated in a mixed methods paradigm. Its merit is that it allows for the conclusions drawn by each method to be nuanced in light of the other. In Paper 5, the surrogate inaccuracy in the decision-making task stood in contrast to surrogates' intention of making a simulated decision as reported in their interviews. This inaccuracy could then be reinterpreted as only being inaccurate from the perspective of the researcher, but not from the perspective of the surrogate who believed they made an accurate decision. Moreover, the pitfall of mixed methods is that one methodological perspective is likely to dominate the other. Quantitative and qualitative methods have conflicting epistemologies, which remain if both methods are brought together under a pragmatist approach in a mixed methods paradigm. In Paper 5, my approach to the qualitative data was similar to that of the quantitative data from an epistemological perspective. I used the interviews to understand the decision process, but also to explain self-other differences and

surrogate inaccuracy. I therefore used the qualitative data as a means to explain the quantitative data while ignoring the fact that both have conflicting epistemologies. In Paper 6, I formulated hypotheses based on findings from the qualitative data in Paper 5 which I then tested in a quantitative paradigm, again assuming that one can be transposed to the other. I failed to support some of these hypotheses, which is perhaps due to the assumption that I could observe the same phenomenon using either methodology. Although I overcame some of the caveats of the experimental approach by incorporating a qualitative element to my work, this was done in keeping with a quantitative framework given my research questions. I was therefore not able to fully realise the potential that qualitative work in the field could have.

2.4. Practical implications

2.4.1. Accountability

I found that self-other differences varied by decision domain in a way that interestingly mirrors real-world problems in each domain. In the medical domain, the worry is that medical professionals are too risk-averse on behalf of their patients. Experimental evidence suggests that physicians make more conservative choices for their patients out of fear of the legal repercussions of taking a risk with negative consequences (Garcia-Retamero & Galesic, 2012). This echoes news reports which have highlighted that surgeons are becoming too risk-averse, to the detriment of the patient (Blackburn, 2017), and doctors are avoiding risky operations due to fear of prosecution (Siddique, 2016). There has indeed been a rise in litigations against medical professionals which has led them to practice defensive medicine (Garcia-Retamero & Galesic, 2012). On the other hand, financial professionals have been accused of being too risk-taking, which has been shown to be a causal factor in the financial crisis of 2007-2008 (Eriksen et al., 2017). This has been explained by the fact that they are rewarded for their gains but not

penalised for their losses, meaning that they end up taking excessive risks which do not pay off (Koudijs, Salisbury & Sran, 2018).

It seems that the medical and financial domains suffer from the opposite problem: too much accountability in the medical domain but not enough in the financial domain. The focus seems to be on losses in the medical domain and on gains in the financial domain. Interestingly, my results somewhat mirror these trends. In Paper 2, I found that people were more risk-taking for others over large financial gains (but not losses) and that they were less risk-taking for others over large medical losses (but not gains). Perhaps this is a reflection of the real-world context of these decisions, which would lend support to social values theory (Stone & Allgaier, 2008). Having said that, a lot more work is needed to understand these results and extend the research on small financial outcomes to large financial outcomes. Nevertheless, given my findings and their real-world context, the implication seems to be that accountability might be a way to shift risk-taking practices. Diminishing the focus on litigations in the medical domain might help give professionals piece of mind in making the decision they believe is in the patient's best interest, whereas increasing regulations tied to financial decisions might reduce excessive risk-taking.

2.4.2. Surrogate decision-makers

My work specific to medical surrogate decision-makers has a number of implications. Previous discussions between the surrogate and the recipient helped the surrogate make their decision in Paper 5. Surrogates appeared more confident that they were making the right decision. Some reported feeling more at ease, as if the responsibility of the decision was shared between them and the recipient, having previously expressed their wishes. It would make sense for discussions to be more helpful than advance directives which can be quite vague, whereas discussions are memories which may play a larger role in their decision process than a written

document. With this in mind, I theorised that discussions would increase participants' likelihood of making a simulated decision, but this is not what I found in Paper 6. Although I validated the finding that having discussions with the recipient increased the surrogate's confidence that they were making the right decision, this did not increase their likelihood of making a simulated decision. This is concurrent with the evidence showing that discussions do not increase the accuracy of surrogate predictions, but do increase surrogates' perceived knowledge and confidence in making the decision (Ditto et al., 2001). The discrepancy between these findings and participants' reports in Paper 5 could be attributed to the fact that the former used quantitative methods and the latter used qualitative methods. This could mean that there is a conflict between what participants say and do or that the quantitative data does not adequately capture participants' propensity to take a simulated perspective. Either way, it suggests that discussions are not an effective way to improve surrogate accuracy.

At this point we can ask ourselves the following question: why should we aim to improve surrogate accuracy? The reason why it is regarded as so important can be traced back to the fundamental ethics of surrogate decision making. The need to address the problem of patients who cannot make decisions for themselves originated from the wish to preserve patient autonomy. Patient autonomy, the right to make informed decisions about one's own medical care, is one of the major ethical underpinnings of medical practice (British Medical Association, 2018). In cases where a patient has lost their decision-making capacity, measures have been put in place to preserve their autonomy. For that reason, surrogates were introduced to ensure that the wishes of the patient would be reflected in the medical decisions made on their behalf. Surrogate inaccuracy becomes a problem because it threatens the preservation of the ethical principle of patient autonomy.

To what extent is the inaccuracy that has been demonstrated in the literature problematic? In some cases, inaccuracy could be the result of differing risk preferences between the surrogate

and the recipient rather than a misunderstanding of the recipient's wishes, as suggested by Paper 5. To understand whether this constitutes a case of inaccuracy as conceptualised by the ethical framework of surrogate decision-making, the relationship between a patient's risk preferences and their health preferences would need to be disentangled. Moreover, there is evidence that patients do not necessarily expect or even want their surrogate to decide solely based on their prior wishes. The majority of patients want their family or physicians to have an input in the decision (Torke et al., 2008). When asked about how they would select a surrogate, people seem to highlight qualities such as honesty, loyalty and care, rather than the surrogate's knowledge of their wishes (Edwards, Brown, Twyman, Christie, & Rakow, 2011). If patients select a surrogate based on the fact that they trust them to make the right decision, this implies that they trust that the surrogate has good reason to take other factors into account than their own wishes, which might lead them to make an inaccurate decision. In light of this, surrogate inaccuracy does not appear as problematic as previously thought and would be worth reassessing.

What is perhaps more problematic is the fact that the perspective of the surrogate is not incorporated in the ethical framework of surrogate decision-making. The focus is on the wishes of the patient, but not on the burden placed on the surrogate. It is known that surrogates find their role stressful and experience it as a burden (Schenker et al., 2012). This has sparked discussions and developed recommendations to alleviate the burden, but the ethics of surrogate decision-making have not been altered in acknowledgment of the surrogate's perspective. Considering that surrogate decisions can lead to the death of the patient – 70% of the time in intensive care units (Radwany et al., 2009) – the person who is left to live with the consequences of the decision is the surrogate, not the patient. The fact that the consequences for them are not addressed is an issue, particularly considering that the patient might also want what is best for the surrogate, who may be the most affected by the decision. Allowing the

surrogate to incorporate their own wishes for the patient may in fact be both ethically sound and realistic given that they find it difficult not to, as shown in Paper 5.

It seems that previous discussions between the surrogate and the patient would help to alleviate the burden. In paper 5, surrogates seemed better equipped to make the decision they think is right and subsequently accept the consequences. There is indeed evidence that advance directives reduce the decisional burden for the surrogate (Hickman & Pinto, 2014), again showing that knowledge of the patient's wishes eases the process. Discussions might be helpful in adapting an advance directive to situations which were not covered by it. They could also help to avoid conflicts between families, acting as a further piece of evidence about the patient's perspective. Although there might not be a clear relationship between discussions and accuracy, encouraging discussions among families can still be an effective way of improving the surrogate decision process, providing a better outcome for all parties involved.

2.5. Future directions

2.5.1. Interventions

Following from the practical implications I have discussed, there are interventions that are worth exploring. Regarding accountability, future work should assess whether strengthening or removing it has an effect on risk-taking, the assumption being that increasing accountability reduces risk-taking and vice versa. Its effects should be rigorously tested in each decision domain as they are likely to be context-dependent. If accountability does impact risk-taking, measures should be taken to alter the context in which professional decisions are made. Although these would benefit from being trialled, this might not be possible in some contexts. In the case of medical decisions, some measures could be trialled in a sample of trusts in the UK for example. However, given the interdependence of financial decisions, it is less likely that an accountability measure can be introduced in some parts of the financial system and not

others. For that reason, rigorous experimentation beforehand is necessary to ensure that changes to accountability do not give rise to harmful unintended consequences.

Regarding prior discussions between surrogates and patients, there is sufficient evidence to suggest they are a promising avenue to reduce the burden on surrogates. However, it might be difficult to assess their impact in a real-world setting. It would likely require longitudinal data which can show the trajectory from discussions to the surrogate decision process, and discussions are themselves difficult to identify and evaluate. An intervention could raise awareness of the fact that these decisions might have to be made and encourage close relative to share their views, in the hope that this would happen sufficiently over time for surrogates to feel better prepared if facing such a decision. Even if it might be difficult to evaluate the effectiveness of such an intervention, encouraging discussions might have other positive implications, such as increasing the frequency of advance care planning and the use of advance directives. Evaluating the impact of discussions in a hypothetical setting may be sufficient evidence to justify taking steps to encourage them.

2.5.2. Expanding this work

I chose to restrict my analysis to particular cases of surrogate decision-making, but there is a lot more to be done in the field. I only investigated cases where there was one surrogate and one recipient. There are many instances where decisions affect a large group of people, particularly in organisational or political decisions. Although these decisions are not necessarily made on behalf of an identifiable other, they can have quite important repercussions for other people and can still be considered as surrogate decisions. I also kept the decisions for self and other separate from each other. However, there are many real-world scenarios where people make decisions for others which also affect themselves (e.g. choosing a meal or holiday for one's family). Future work could benefit from turning its attention to them, particularly in

the context of shared decision-making. Relatedly, I did not set up scenarios where the surrogate and the recipient could confer with one another. In reality, surrogate decisions are likely to be embedded in a context of discussion with the recipient or other parties involved. Understanding how these interactions alter the decision process would be a valuable path for future work. This would be particularly applicable to areas where decisions are a negotiated process, such as within organisations, and in decisions involving medical professionals where shared decision-making is the norm. I chose to focus on ordinary decision-makers, but it would be worth investigating how these decisions are made in professional settings and how expertise affects the process.

I focused on the financial and medical domains from Paper 2 onwards, but there are many more contexts in which surrogate decisions manifest themselves. We regularly make decisions for our loved ones (e.g. planning meals, trips, gifts etc.) and are often involved in their decision process (e.g. giving them relationship advice). Parental decision-making (Dore et al., 2014) and relationship decisions (Stone & Allgaier, 2008) have been previously investigated and it would be interesting to see whether my findings transfer to these domains. The health and safety decisions parents make for their children are similar in outcome to the ones I report in the medical domain, but we do not know how the decision process compares. In terms of professional decision-making, there are many contexts other than the financial and medical sector in which surrogate decisions are prevalent (educational, organisational, political, judicial etc). Decisions in those contexts can have profound consequences and they would benefit from being tackled by the surrogate decision-making literature.

To further our understanding of how surrogate decisions are made, I have suggested expanding my work to other contexts and surrogate-recipient relationships. This will require the use of different methodologies. I have spoken of the limitations of investigating hypothetical decisions and the self-other paradigm. If we want to understand how surrogate

decisions play out in their respective contexts, this requires observing what actually occurs there. The reality of these decisions is likely to be far more complex and context-specific than the literature on surrogate decision-making suggests. For example, my work has spoken about the substituted judgment standard without turning attention towards the geographical variations in its use as an ethical or legal framework[4]. In order for these findings and recommendations to be applicable, they need to be put to the test in a real setting. Further, if we want to understand the role that social values have on the process, they will need to be studied in much more depth and nuance than they have been so far. A social value represents far more than what a group of undergraduates believes is an acceptable decision or what the majority would do. In terms of the self-other paradigm, it cannot on its own tell us much about surrogate decisions. The discrepancies across studies suggest that self-other differences found in one scenario may not transfer to another, which severely compromises their generalisability. A significant amount of research, including my own, has focused on explaining self-other differences. The field would benefit from changing its angle.

2.5.3. Conceptualising risk

Risk is a complex multi-faceted construct. It can refer to both the probability of an outcome occurring and the severity of the harm that choosing a particular option entails. Across my studies, I have considered the risky option as the probabilistic option (or the one with the lowest likelihood of occurring). However, there were cases where the safe option also carried risks of harm, such as refusing treatment for a medical condition in Studies 2-4. I purposefully

[4] The assumptions underpinning my work more closely match the US context where the substituted judgment standard is the dominant framework and has been heavily discussed. My work sits nicely within that literature, but it could do with being transferred to the UK context where surrogates are required to incorporate both the patient's prior wishes and best interest. It seems that the way surrogates make decisions, as shown in Paper 5, conforms more to the UK's than the US's legal requirements.

did not label the options presented to participants in Studies 5 and 6 as risky or safe to avoid misrepresenting them. Although the probabilistic option carried a risk of impaired quality of life, the alternative was mortality – labelling either as safe would have been misleading. Risk was easier to identify in the financial scenarios I used than in the medical ones, meaning that it is more difficult to draw clear conclusions about how risk preferences change for others in a medical context. For that reason, I have been more careful in my interpretation of medical decisions by specifying the outcome I was referring to.

Furthermore, I have been careful not to make unjustified claims when referring to risk neutrality. The concept of risk neutrality was useful when speaking of the predictions made by the risk-as-feelings hypothesis. It made sense in the context of a financial gamble where it referred to being indifferent between a safe and a probabilistic option of the same expected value. On the other hand, in a medical context, what can be considered as risk-seeking or risk-averse is more difficult to judge, and consequently where neutrality lies is as well. However, one can be a lot more critical of my use of terms related to risk than I have been. I have spoken about the fact that surrogates are more cautious for others than themselves when making treatment decisions on their behalf. What I meant by this is that surrogates are more likely to avoid a risk of death at all costs for others than themselves. However, it could be that impaired quality of life (e.g. vegetative state) is considered much worse than death, which presumably is what is reflected by a participant's choice of a risk of mortality over a risk of impaired quality of life. This might not be a careless or highly risk-seeking choice, in which case surrogates would in fact be taking a bigger risk for someone else than for themselves.

What is considered cautious or risky is not always clear cut. The implications of this are worth discussing as labelling something as risky might lead to undesirable consequences. Risk is often seen in a negative light and indeed defined as the likelihood of harm occurring. A large amount of effort has gone into minimising risk in our society, from reducing risk-taking

behaviours (Hale, Fitzgerald-Yau, & Viner, 2014) to making risk assessments routine in various professions (Gillingham, 2006). This has led our society to being conceptualised as a risk averse society, where a concern for risk management has become central to everyday life (Bates & Lymbery, 2006). It has been suggested that our society is unwilling to support decisions which could be harmful, instead favouring safety and risk avoidance. This has been linked to increased accountability felt by social workers who are then lead to practice defensible decision-making (Gillingham, 2006). Under the appearance that risk has been adequately minimised, these decisions can actually have detrimental consequences for child protection. A similar argument can be made about medical professionals who also seem to practice defensive decision-making (Garcia-Retamero & Galesic, 2012). Choosing an option which carries an obvious risk is not necessarily worse than choosing a safer option where the risk is not obvious at the time the decision is made, although it is a harder choice to justify. If we were to reconceptualise risk and shift our attitudes in a way that allowed for taking reasonable risks, with a reasonable level of accountability associated to doing so, we might be in a better position as a society to make good decisions.

2.6. Conclusions

The work presented in this thesis has made valuable contributions to our understanding of surrogate decision-making, both in terms of its findings and the implications I discussed. I brought together different literatures and disciplines to provide an overarching review of surrogate decisions. I expanded the field by proposing and testing my own novel hypotheses throughout, while also evaluating existing theories. I provided useful methodological insights, drawing from different perspectives, which allowed me to evaluate the field from a new angle. Finally, I opened up new research avenues and made recommendations for future work.

I would like to end on revisiting the major reflections this work has inspired which can speak to research beyond my particular field. Firstly, the trade-off between depth and breadth of understanding is one that is difficult to resolve. My approach favoured breadth, as can be seen from how I tackled many questions and ideas throughout my studies. Without this approach, I would not have been able to navigate the same breadth of disciplinary and methodological perspectives. However, the problem with this approach is that the complexity of surrogate decisions requires an in-depth investigation, as was highlighted by my mixed methods paper. More work of that nature needs to be done to adequately deal with their intricate process. Equally, work that pulls findings together under a coherent framework is necessary to avoid losing sight of the phenomenon of surrogate decision-making as a whole.

Secondly, the questions that surrogate decision-making poses require multiple perspectives. Explaining how surrogate decisions are made is not sufficient if we are to develop ways of addressing some of the problems associated with them. Understanding the experience of all parties involved is necessary to tackle these problems in a meaningful way. For example, surrogate inaccuracy becomes less of a problem if the recipient insists that other factors than their own wishes should be considered by the surrogate. In such a context, identifying, explaining and targeting the inaccuracy loses significance. Understanding the recipient's perspective is just as valuable as explaining the surrogate's decision process. Of course, this is assuming that there is a relationship between the value of research and its capacity to address real-world problems. Irrespective of that relationship, explaining surrogate decisions remains an interesting pursuit. Nevertheless, I do not see a clear reason why the causal factors underpinning surrogate decisions might be more valuable than the experiences of the people involved in the process. Yet there is a lot more research focusing on the former – it would be encouraging to see more on the latter.

Thirdly, the capacity of each discipline to understand surrogate decisions is limited. The pitfall of the approach taken by psychology is its detachment from the real-world context of surrogate decisions, making its applicability difficult. The health literature has the opposite problem in that its applied focus makes it very specific to a particular context. The way economics proceeds encounters a similar problem but because it is restricted by its strict commitment to incentivised and tightly controlled settings. Each of these disciplines would benefit from opening their perspective to the others. The constraints imposed by each discipline can prevent them from considering the others to be relevant (such as non-incentivised psychological experiments being disregarded by economics). However, the picture would not be complete with those three disciplines alone – the complex sociocultural context in which surrogate decisions take place requires an analysis that goes beyond what those three disciplines can offer. My work has tried to overcome the parochialism of these disciplines, but a lot more is required to fulfil these objectives.

The problems I have highlighted are far from new, but it is easy to turn a blind eye to them. The tensions between methodologies and disciplines are obvious yet rarely explicitly addressed when research is disseminated. Reflecting on them should be an integral part of research, which is why I have chosen to address them here. They illustrate both the merits and limitations of my work and provide a valuable way of evaluating psychological research. The implications of my work make for meaningful contributions to the field of surrogate decision-making, but also span further than the research questions that were originally posed.

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