Is it Possible to Accurately Forecast Suicide, or is Suicide a Consequence of Forecasting Errors?

Patterns of Action Dissertation

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Is It Possible to Accurately Forecast Suicide, or is Suicide a Consequence of Forecasting Errors?

“Where have we come from? What are we? Where are we going? ...They are not really separate questions but one big question taken in three bites. For only by understanding where we have come from can we make sense of what we are; only by understanding what we are can we make sense of where we are going”


Abstract

Forecasting has been applied to many disciplines however accurate forecasting of human behaviour has proven difficult with the forecasting of suicidal behaviour forming no exception. This paper will discuss typical suicidal processes and risk factors which, it will be argued, have the potential to increase forecasting accuracy. Suicide is an emotive social issue thus it is essential that the forecasting of this behaviour is attempted in order to be able to successfully apply prevention and intervention strategies. The essay will provide a novel suggestion that suicide is a consequence of poor behavioural forecasting, specifically inaccurate affective forecasting of one’s own emotions. The commonly observed affective forecasting error ‘immune neglect’ will be particularly implemented in suicidal behaviour with the proposal that suicidal individuals have dysfunctional psychological immune systems which ordinarily would buffer humans from negative affect and experiences. Finally the idea that suicide is ultimately the result of faulty or risky decision making as a consequence of poor affective forecasts will be explored. It will be concluded that these arguments imply it would be beneficial to educate and raise awareness of typical affective forecasting errors in order to reduce the likelihood of high-risk behaviours occurring as the result of poor decision making based on these inaccurate forecasts.

Abbreviations: World Health Organisation (WHO); General Practitioner (GP); Non-Suicidal Self-Injury (NSSI); Cognitive Behavioural Therapy (CBT); ventral medial prefrontal cortex (vmPFC); Psychological Immune System (PIS).
Introduction

Suicide, defined as the 'act of deliberately killing oneself' (WHO, 2014) accounts annually for approximately 800,000 deaths (WHO, 2014). Whilst suicide is a relatively rare event, statistics are speculated to underestimate mortality by up to one third (Gosney and Hawton, 2007), primarily because ruling suicide as the cause of death requires explicit intention to die. Intentionality is difficult to judge without a legitimate suicide note considered to be present in only 3-42% of suicides (Paraschaskis et al, 2012). Suicide prevention is a high priority for the UK government (Department of Health, 2012); however understanding suicidal behaviour is controversial and complicated. Action forecasting, the subjective prediction of future events based on previous ones, has been applied to human behaviour within the clinical field among other disciplines, to predict patients’ prognoses. Primary healthcare professionals are vital in the prediction of suicide; Williams (2001) reported 50-80% of suicide victims had visited their GP in the month prior to their suicide; therefore it is essential for such professionals to be adequately trained in the detection of suicidal signs and processes in order to implement effective prevention strategies. Currently GP detection is inadequate with 50% of major depressive individuals failing to be recognised (Williams, 2001), however suicidal behaviours are typically private thus its detection is not a straightforward task for GPs. Accurate suicide forecasting, if achieved, would provide opportunities to implement effective prevention and intervention strategies for those appearing at high-risk of suicide. Rosen (1954) first highlighted the limitations of forecasting the relatively infrequent events which occur in suicidal individuals and since then the general consensus is that suicide cannot be forecasted. Despite this, typical suicidal processes and risk factors can provide a potential basis for the forecasting of suicide. Whilst the heterogeneity of suicide cannot be ignored, false positive suicide forecasts are less detrimental than false negatives or dismissing the practice of forecasting altogether. It is argued that suicide, for at least a minority of individuals, can be forecasted providing opportunities for successful prevention. This paper aims to address the issues of whether suicide can indeed be forecasted accurately and whether suicide occurs as the result of human’s renowned inability to accurately forecast their emotions.
Can Individual Behaviour Be Forecasted?

Human behaviour is multi-faceted arising from unique combinations of contributing factors, all of which must be considered when forecasting. Clarke’s (1992) ‘Seven Column Forecasting’ technique proposed a behavioural forecasting method using ‘rolling horizon forecasting’. Firstly an ad-hoc prediction and its rationale are presented, the real subsequent event is then revealed and the discrepancy between these is analysed. A set of heuristics are then compiled as a consequence of this analysis to enhance accuracy in future forecasting attempts. Whilst it would seem rational to assume a model that can accurately predict the past would be equally equipped to predict the future, consistently low correlations have been obtained (.3). Accurate forecasting is made considerably difficult due to the dynamic nature of the world; whilst a model may be accurate for a specific time period, the world then diverges reducing its accuracy.

Behavioural forecasting research has consistently elicited what Clarke and Blake (1997) termed the ‘Super-Reversal Effect’. This is a phenomenon in which humans are relatively more successful in predicting previous events than subsequent ones. Time maze experiments using a range of event sequences, including road traffic accidents, pub violence (Figure 1) and autobiographical stories, have produced significantly greater forecasting accuracy in backwards conditions, predicting past events, compared to forwards conditions, in which future events are forecasted (Clarke, 1999). Clarke and Blake (1997) posited a range of potential explanations for this observed effect including the suggestion that the world is asymmetrically formed. It is argued that the diverging nature of the world produces a greater number of possible future events than possible preceding events.

![Figure 1: The Accuracy Scores for Cases of Pub Violence for both Forwards and Backwards Conditions, from Clarke (1999)](image)
To conclude, whilst forecasting methods have improved considerably across many disciplines (Squire, 1988; Craft, 1998), behavioural forecasting remains inadequate as demonstrated by the existence of the super-reversal effect. This however must not be taken as reason to abandon forecasting efforts as there often is reliable factors on which to base forecasts.

**Can Suicide be Accurately Forecasted?**

Suicide is a particularly problematic behaviour to forecast most simply because of its rarity causing predictions to be made using low base rates increasing the likelihood of inaccurate forecasts (Sher, 2011). Additionally, suicidal behaviour is often a private behaviour; people typically refrain from divulging suicidal thoughts and actions making prediction considerably more difficult. Suicide, as with all human behaviour is highly complex resulting from an interaction of multiple individualised risk factors. Despite the identification of many suicide risk factors, psychological models continuously fail to accurately predict suicide; Goldstein, Black, Nasrallah and Winokur (1991) for example, identified a range of risk factors for clinical populations including: prior suicide attempts; suicidal ideation; bipolar affective disorder; gender; and depression yet failed to recognise any patient who eventually committed suicide. Additionally, Powell et al (2000) identified a mere 2 of the 112 psychiatric inpatients as having a predictive suicide risk above 5% using the acknowledged risk factors: planned and actual suicide attempts, recent bereavement, chronic mental illness and a family history of suicide. These studies therefore emphasise the difficulty of suicide prediction even amongst high-risk individuals.

Nevertheless, a range of ‘give away’ actions and processes have been observed in individuals who commit suicide, thus it is argued that accurate forecasting is obtainable for a subgroup of suicidal individuals. Suicide is often not an isolated behaviour which is advantageous for forecasters as preceding actions can draw attention to vulnerable individuals. Behaviours which typically precede completed suicide include suicide ideation, threats, plans, self-harm and suicide attempts. Suicide ideation, the preoccupation with suicidal thoughts, is often is the most private of these behaviours and is relatively common amongst the general population; Forkmann et al (2012) reported 8% of their representative German sample exhibited suicidal ideation, indicating community-wide screening may be beneficial to highlight potentially vulnerable individuals.
The Suicide Process

The existence of typical pathways to completed suicide with these preceding actions provides the opportunity to accurately forecast the behaviour. The *Suicidal Process Theory* and *Pyramid Theory* have been proposed to outline common suicidal trajectories (Hawton and van Heeringen, 2002) with suicidal behaviour being described as a continuum progressing from suicidal ideation to eventual suicide. The *Suicide Pyramid* (*Figure 2*) diagrams the typical ascending flow of events from suicidal ideation within the general population to recurrent ideation and concrete suicide plans, to non-fatal suicide attempts and finally to the execution of completed suicide. Hawton and van Heeringen (2002) refers to the movement up the pyramid as a ‘suicidal career’ determined by a complex interaction of risk and protective factors. The pyramid proposes a general suicidal pathway in which detection of any of these behaviours can be used to predict future suicide with some degree of accuracy. Gooding, Sheehy and Tarrier (2013) support the suicidal process concept also suggesting suicidal behaviour to be a continuum of severity from thoughts to fatal actions. They suggest interventions must be specific to the individual’s current position within the process, social support, for example, was found to an effective method in reducing suicidal ideation but proved ineffective in combating suicidal plans or acts. The suicidal process concept provides a basis for suicide forecasting indicating typical behaviours which may precede suicide.

*Figure 2:* The Suicidal Pyramid, adapted from Hawton & van Heeringen (2002)
A graphical representation of the Suicidal Process (Figure 3) demonstrates the instability of suicidal thoughts and behaviour indicating movement through the pyramid is not straightforward. The self-disclosure line represents the highly individualised point at which suicidal thoughts become observable to others. Individuals with high disclosure lines are most problematic to forecast, they portray few or no overt suicidal signs, thus their suicidal behaviour is often unnoticed reducing the likelihood of accurate forecasting and successful intervention implementation. The disclosure line also determines the perceived duration of the suicidal process; the lower the line, the longer the suicidal process, as it becomes apparent earlier in its course. Females, on average, exhibit greater durations (52 months) relative to males (31 months) consistent with the finding that females are, on average, more emotionally extroverted (Runeson et al, 1996). Male domination amongst suicidal individuals who exhibit few explicit suicidal signs prior to the final act could account for relatively higher rates of male suicides (Office for National Statistics, 2014) as intervention is unlikely to be offered to individuals who express little need for it, highlighting the need for community-wide intervention and education strategies. The existence of a typical suicidal process suggests eventual suicide can be accurately forecasted, however individual differences in self-disclosure and overt suicidal behaviour emphasises that this ‘common pathway’ cannot account for all completed suicides. 60% of suicides are reported to occur without any history of suicidal behaviour (Hall and Platt, 1999) and a significant proportion of individuals, arguably primarily males, follow the process but do not present any overt suicidal signs thus accurate forecasts for such individuals is improbable.

The suicidal trajectory fails therefore to account for a substantial proportion of suicides with progression through the pyramid determined by a combination of individualised risk and protective factors. Whilst suicide has been associated with a wealth of risk factors including: family history of
suicide, insecure attachment, low parental monitoring, bullying and sociocultural factors, only a minority have consistently been beneficial to the forecasting of suicide. Suicide is highly individualised, however there are a number of factors that have reliably been associated with completed suicide.

**Mental Health**

Firstly, atypical mental health is a commonly observed precursor to suicide; Bennett (2011) proposed mental health problems could be identified in half of all completed suicides, particularly major depressive disorder, substance abuse and schizophrenia. Meltzer (1998) approximated 15% of sufferers of these disorders eventually commit suicide indicating a substantial role of mental health in suicidal behaviour. Effective primary healthcare is therefore essential to ensure correct and early diagnosis and to provide ongoing treatment to prevent escalation of suicidal tendencies. Cognitive behavioural therapy (CBT) is typically the treatment of choice for these psychiatric disorders, it aims to alter distorted cognitive thinking and has been found to be particularly effective for treating depression; Dobson’s (1989) meta-analysis found CBT to be effective over and above control groups, antidepressant drug treatment and other psychotherapies. Effective treatments such as CBT indicate suicide prevention is manageable for selective individuals with diagnosed psychiatric disorders.

**Interpersonal Psychological Theory of Suicide**

Joiner (2005) proposed the *Interpersonal Psychological Theory of Suicide* suggesting three main factors lead to eventual suicide indicating identification of all or any of these can assist in predicting a future suicide attempt. The proposed factors include: *thwarted belongingness*, the perceived lack of meaningful connections with the world; *perceived burdensomeness*, the belief that one fails to meaningfully contribute to the world; and finally the *reduced fear of death and pain*. The model suggests exposure to pain, often through self-harm, increases an individual’s pain threshold and subsequently lowers their fear of death making suicide a considered option. The theory posits simultaneous presentation of these factors and their perceived stability may be sufficient to cause active suicidal behaviour. Kleiman, Liu and Riskind (2013) investigated the theory specifically with depressed individuals; depressive symptoms were strongly associated with feelings of increased burden and lack of belonging, suggesting depression may act as a precursor to the suicidal process. The *Interpersonal Psychological Theory of Suicide* therefore provides further factors which can assist in the forecasting of suicide and provides further validity for the use of atypical mental health in forecasting.

**A History of Suicidal Behaviours**

Previous suicidal behaviour is currently considered the best predictor of suicide, providing support for the suicidal process and providing further opportunity to forecast suicide with some
accuracy. Pearce and Martin (1994) noticed attempted suicide was significantly associated with suicidal ideation, self-harm and previous non-fatal attempts. Hawton, Zahl and Weatherall (2003) reported 40-60% of suicide victims had a history of self-harm with repeated episodes offering three times greater predictive value (Zahl and Hawton, 2004). Therefore whilst clinicians are advised to adopt multi-modal methods of assessment to determine a patient’s likelihood of future suicidal behaviour, forecasting a patients’ suicidal prognosis is significantly more accurate when primarily considering past self-harm behaviours (Janis and Nock, 2008). As appears to be the common theme within suicide research, even highly consistent risk factors cannot account for 100% of suicide cases and not all individuals exhibiting suicidal behaviour present themselves voluntarily or involuntarily to the medical system in order to obtain support and assist forecasting practices (Pearce and Martin, 1994). Hawton et al’s (2012) diagram (figure 4) suggests the vast majority of self-harmers at risk of eventual suicide do not present themselves to the clinical services indicating a past history of suicidal behaviour, whilst useful for forecasting, can only be applied to a small proportion of suicidal individuals.

Suicide has therefore been associated with a range of contributing factors which despite reflecting the individuality of the behaviour does offer some potential basis for suicide forecasting. Whilst no risk factor accounts for all completed suicides, the accurate prediction of even a few cases can improve the efficacy of intervention strategies thus reducing suicide and its far-reaching consequences. Beck et al (2005) suggested false positive forecasts are considerably less problematic than false negative forecasts of suicide; it is less detrimental to suspect someone of future suicide and to provide them with support rather than to miss the warning signs in someone who eventually...

Figure 4: Representation of the Relative Prevalence of Self-Harm and Suicide (Hawton et al, 2012).
commits suicide. It is suggested therefore that suicide forecasting should continue irrespective of anticipated inaccuracies. In summary, the forecasting of suicidal behaviour is undeniably a problematic and often inaccurate task however there are many factors which can assist in the process. Whilst forecasting on an individual level appears difficult it would suggest that prevention strategies should aim to reach the general population in order to help those who do not explicitly appear at-risk. There appears a need for community-wide suicide prevention strategies which focus on education of the ‘warning signs’ and reducing the stigma associated with suicide in order to encourage individuals to seek help. Currently only modest effects have been reported for such strategies (Jorm, Christansen and Griffiths, 2005; Paykel, Hart and Priest, 1998) however I would argue that these strategies need to be further developed as they have the potential to reach individuals who would ordinarily not receive support.

Is Suicide a Consequence of Poor Affective Forecasting?

This section will consider whether human’s inability to forecast emotions can account for suicidal behaviour. It is argued that forecasting human behaviour is inhibited by one’s inability to forecast individual emotional responses to future events. Affective forecasting, defined as the prediction of future emotions (Wilson and Gilbert, 2003), is particularly important for the execution of suicidal behaviour; forecasting prolonged negative affect can encourage suicidal behaviours as a means to escape an undesirable future (Baumeister, 1990). Typical affective forecasting errors will be discussed to suggest suicidal individuals exhibit extreme biases.

Can Humans Accurately Forecast Emotions?

Emotions form a vital component of our thoughts and subsequent actions (Slovic et al, 2007). Humans are notoriously bad at affective forecasting which is likely to significantly impact upon subsequent behaviour. Affective forecasts require mental simulation of possible future outcomes (Gilbert and Wilson, 2009) which often results in systematic biases expressed through inaccurate affective forecasts. People consistently overestimate the duration and intensity of their future emotions, and the extent to which future emotions will reflect their current mood (figure 5). Systematic affective forecasting errors include focalism, impact bias, duration bias and immune neglect.
Figure 5: The Predicted and Actual Emotional Reactions to Future Events, from Wilson and Gilbert (2003)

**Focalism**
Focalism is the disproportionate focus on a single event when considering future affect (Rhodes and Strain, 2008). Focalism has been frequently demonstrated; Wilson et al (2000), noticed students predicted elevated happiness for an average of 3 days following a football victory when in reality their elated mood lasted only one day. The participants demonstrated a preoccupation with the specific event failing to consider the affective influence of subsequent events.

**Impact Bias**
Impact bias is the tendency to overestimate the emotional impact of a future event based on its perceived importance (Wilson et al, 2000). Dunn, Wilson and Gilbert (2003) questioned students on how being placed in particular dormitories would make them feel; students overestimated feelings of happiness following desirable allocation and sadness following undesirable selection as a year later equal happiness was reported across groups. This study emphasises the tendency to expect events to have a significantly greater emotional impact than actually occurs.

**Duration Bias**
Duration bias refers to the specific overestimation of the permanence of emotions. Typically life events influence well-being for 2-3 months however individual forecasts continuously overestimate this time period. In an extreme example, Affleck and Tennen (1996) reported less long-term emotional impact from the loss of a child than is typically forecasted.

**Immune Neglect**
Immune neglect is the lack of awareness and consideration of the powerful, unconscious Psychological Immune System (PIS), which naturally buffers humans from negative life events, when making affective forecasts. The PIS is a self-regulating emotional system which people typically fail to acknowledge when considering their response to negative or traumatic events (Igou, 2008; Hoerger et al, 2009). The PIS allows people to adaptively restructure their perceptions; Gilbert et al (1998)
noticed unsuccessful election candidates could only appreciate the victorious opposition’s strengths after results were revealed. The internal system therefore promotes attention to, encoding of and storing of information in ways to increase satisfaction and encourage maximum happiness.

**Application of Affective Forecasting Errors to Suicidal Individuals**

Immune neglect, it will be argued, is the error most highly associated with suicidal individuals. It is possible that suicidal individuals have dysfunctional PISs. It has been suggested that the PIS is only activated when there is a perceived lack of choice highlighted by Gilbert et al’s (1998) in which defeated candidates could only appreciate the opponent’s positive attributions after the results were revealed; the PIS therefore assists in accepting unchangeable negative outcomes.

Olah (1996) developed the *Psychological Immunity Model*, suggesting the PIS is a system of integrated cognition, motivation and behavioural personality dimensions that activate during stressful situations in order to promote healthy development. The model consists of sub-systems which facilitate approach behaviours towards positively appraised environments. Dubey and Shahi (2011) argue that the approach-belief subsystem is strongly associated with depression suggesting the PIS may be dysfunctional within clinically depressed individuals. As discussed previously, depression is a common precursor to suicide, thus this research implies depressed suicidal individuals may also have a dysfunctional PIS.

Evidence therefore indirectly suggests dysfunctional PISs within suicidal individuals and further evidence of individual differences in affective forecasting errors provides greater justification for this claim. Hoerger et al (2010) observed perceived importance of the specific event and working memory capacity was associated with increased forecasting biases. Working memory is suggested to facilitate recovery after traumatic or negative events; therefore a greater working memory capacity increases the bias as forecasters fail to account for its positive influence. Suicidal individuals have been reported to exhibit executive dysfunction in tasks measuring attention and working memory (Keilp et al, 2013), indicating their dysfunctional working memory may contribute to an inefficient PIS relative to healthy individuals. Morris (2009) support the view that PISs do not act consistently across individuals proposing techniques to strengthen one’s system suggesting the PIS can be trained to function adequately through exposure techniques similar to how our physiological immune systems are enhanced. This implies therefore that PISs do not operate consistently across individuals suggesting some may occupy a poorly functioning PIS.
Alternatively, suicidal individuals may exhibit an extreme version of the immune neglect bias. As highlighted by the Interpersonal Theory of Suicide, individuals with suicidal tendencies report loneliness and increased burdensomeness which may influence the severity of the bias. Mallett et al (2008) reported perceived group membership reduced the bias whilst social exclusion increased the bias (DeWall and Baumeister, 2006). Additionally, Twenge et al (2002), after experimentally manipulating subjects’ feeling of social exclusion, observed more irrational, self-defeating risks and unhealthy behaviours in the socially excluded group. Suicidal individuals who feel socially excluded may therefore exhibit extreme immune neglect bias. This argument highlights the need to educate people about the utility of their PIS in order to reduce negative affective forecasts (Hoerger et al, 2009).

What is the Impact of Poor Affective Forecasting on Suicide?

Affective forecasts are believed to form the basis for decision-making (Wilson and Gilbert, 2005), thus forecasting errors are likely to significantly impact behavioural responses. People aim to maximise happiness by making decisions they perceive will provide satisfaction; inaccurate affective forecasts however can result in less optimal outcomes. Patients with ventromedial prefrontal cortex (vmPFC) lesions provide evidence for the proposed association between affect and decision making consistently performing poorly on Iowa Gambling Tasks. The vmPFC is implemented as both the brain’s emotion regulation centre (Hänself and von Känel, 2008) and the site for decision making (Fellows and Farah, 2007), so has consequently been identified as the brain region responsible for affective forecasting (Bechara and Damasio, 2005). Suicide attempters have also been found to display poor decision making in similar tasks exhibiting decreased brain activation during risky decisions relative to safe decisions (Jollant et al, 2005). Bridge et al (2012) reported suicide attempters were less likely to learn and consequently implement the optimal strategy in the gambling task suggesting high-risk individuals exhibit inflexible decision making. Humans are generally considered rational beings however emotions are thought to disrupt rational decision making which may account for suicidal behaviour; it is argued that suicidal individuals struggle to control and accurately forecast their emotions resulting in risky decision making.

Rational Choice Theory

Rational choice theory, traditionally an economic principle, assumes humans, as rational beings, make decisions which promote happiness and satisfaction. People are thought to make
decisions based on the careful evaluation of possible actions and their likely consequences. Rational decisions consist of choosing actions based on preferences, outcome expectations and alternative options. Actions can be expressed as a set of exhaustive and exclusive options:

\[ \text{Action} = (\text{action}_1, \text{action}_2, \text{action}_3) \]

Lester (1988) attempted to apply the theory to suicide proposing suicide to be just one possible responsive action to excessive distress. In rational acting individuals, suicide would be cautiously evaluated amongst alternative actions whereas suicidal individuals are arguably more biased towards suicide due to inadequate appraisal of alternative actions supported by previous findings that such individuals exhibit unsatisfactory decision-making in experimental tasks. Figure 6 has been produced to simplify the proposed decision making process that results in suicide, it is suggested that a negative life event leads to the formulation of possible responsive actions. Individuals with irrational decision making abilities have increased chance of selecting the high-risk actions, whereas a healthy rational individual would select adaptive strategies.

*Figure 6: Proposed Model Applying Suicidal Decision Making to Rational Choice Theory.*

In summary, it has been suggested that typical affective forecasting errors may be exaggerated in suicidal individuals particularly immune neglect bias in which the PIS fails to activate or is less accounted for by such individuals. Additionally it has been suggested that suicide occurs as a result of poor decision making influenced by error-prone affective forecasts. *Figure 7* displays these proposed ideas in combination, suggesting individuals with dysfunctional PISs have increased risk of affective forecasting biases which can result in detrimental decision making.
Figure 7: A Diagram of the Proposed Ideas that Suicidal Individuals have Dysfunctional PISs Causing Increased Forecasting Errors Resulting in Irrational Decision Making.

Conclusion

It is generally accepted that suicide cannot be accurately forecasted however this essay aimed to suggest factors which allow for accurate prediction within selective individuals who follow the proposed trajectories. Furthermore, it has been argued that affective forecasting errors are influential over decision making processes which may be able to account for the decision to commit suicide. Forecasting indefinite negative affect is likely to impact upon the action that is considered the most beneficial in one’s current circumstances. These suggestions indicate that it is necessary to raise people’s awareness of the typical affective forecasting errors and to encourage individuals to generate and carefully evaluate a range of options before making a final decision. Suicidal forecasting on an individual level has proven difficult therefore these prevention strategies should be implemented community-wide raising general awareness of one’s PIS and optimal decision making strategies. The devastating consequences of suicide for all those involved emphasises the need to continue the effort to forecast suicide in order to implement interventions where possible.
Reference List


