Dissertation protocol

Student number: 1064309; Course: MSc Research Methods in Health Sciences (Part Time)
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Proposed title
*What are the neurocognitive factors that predict repetition of self-harm?*

Lay summary
We know that self-harm (an individual deliberately harming themselves by any means) is the second biggest cause of death in young people. We know that any self-harm may lead to more self-harm in the future, and one quarter of those who self-harm for the first time will self-harm again within four years. Unfortunately, some instances of self-harm carry a risk of serious injury or death. Therefore, if someone attends A&E or their GP stating that they have self-harmed or are thinking of self-harm, it is important that we identify whether they are likely to self-harm in the future and offer appropriate support and work with them to prevent this from happening.

Most research into self-harm has focused on what is written in a person’s medical notes. We know that this does not tell the whole story. Therefore, we would like to look at the way a person’s brain works, particularly psychological brain activity and functions. We know that some of these have been linked with self-harm, but we do not know if they increase a person’s chance of harming themselves in the future.

Therefore, this dissertation will be a comprehensive review of the published literature on this topic: whether a particular pattern of psychological brain activity and functions might predict an individual’s chance of self-harm in the future if this has happened in the past.

Background
*Why is this topic important?*

Suicide is an important public health problem: it is the second most common cause of death in young people (Biddle *et al.*, 2008) and rates of self-harm amongst young people are rising (Hawton *et al.*, 2012). The risk of suicide appears to be increased in the years following any self-harm episode (Owens *et al.*, 2002). After a first episode of self-harm, approximately one in six patients repeats self-harm over the first year, and one in four after four years (Owens *et al.*, 2002).

One would expect that in order to reduce future risk, intervening in the repetition of self-harm at the earliest possible stage would be advantageous (i.e.) “early intervention” in suicide prevention following a first episode of self-harm in either primary or secondary care. If we can identify high-risk individuals early and target appropriate treatment, we could aim to reduce long-term morbidity and mortality and increase functioning.

*Why should we research it in this way?*
To date, the majority of self-harm research has focussed on retrospective identification of high-risk individuals following suicidal behaviour using demographic and clinical factors (e.g.) age, sex, forensic status, diagnosis of mental illness. This is because this information is easily achievable from patient records, rather than requiring direct patient contact (Hawton et al., 1999; Hawton et al., 2002). However, the increasing suicide rate implies that understanding of these factors is probably inadequate alone in terms of predicting future risk of self-harm. For example, the 2014 confidential inquiry report on suicides in primary care found that 37% of those who died by suicide between 2002 and 2011 did not have a mental health diagnosis recorded on their GP records (NCISH, 2014), so understanding of how diagnosis may increase risk may be of limited utility. Prediction of future risk of self-harm is likely to be enhanced if this non-individualised data could be combined with individual-based factors.

Recently, there has been further exploration into potential brain structural abnormalities in patients who have a history of self-harm behaviour and the associated brain activity and functions (also known as neurocognitive correlates). However, this has been relatively under-researched. Van Heeringen and colleagues performed a recent systematic review into the brain abnormalities associated with self-harm, and concluded that the orbitofrontal cortex and the dorsolateral prefrontal cortex were likely to be involved (van Heeringen et al., 2011). There was also evidence of anterior cingulate cortex and the amygdala abnormalities, but the data was sparse (van Heeringen et al., 2011). The neurocognitive correlates of these brain areas, such as decision-making, impulsivity and sensitivity to emotional feedback, have been linked to self-harm (Oldershaw et al., 2009; Giegling et al., 2009; Jollant et al., 2008). However, it is less clear if we can apply these correlates clinically: that is, use assessment of these factors in an individual to predict the risk of future self-harm. Before we can determine this, it is important to have a clear understanding of the scope of the existing literature and to what extent neurocognitive factors and repetition of self-harm have been examined together. To my knowledge, a synthesis of the non-imaging and imaging data in this area has not been published.

Personal context for this dissertation

As a Psychiatry trainee, I regularly review patients who present as an emergency outside working hours with current suicidal ideation and / or following episodes of self-harm. My role is to assess whether this individual patient would be able to keep themselves safe for the immediate future if they were to be discharged into the community with appropriate support. If it is felt that the risk is too great, then in the short-term for their own safety (primarily to prevent a future episode of self-harm, which might result in significant morbidity or mortality) we would recommend admission to hospital – either voluntarily or, if the patient refuses consent or does not have the capacity to consent, under a section of the Mental Health Act. Longer-term, patients who are assessed as high risk of future self-harm may receive follow-up support from the appropriate community mental health service, potentially including the offer of psychological therapies, a named care co-ordinator, and / or regular reviews with a Psychiatrist.

However, I am aware that both I and my colleagues can find this initial risk assessment process very difficult, particularly for the patients for whom it is their first episode of self-harm and without previous
interactions with mental health services. It is like we are being required to have a “crystal ball” in order to work out what the patient is likely to do in the future. Standard risk assessment tools, which have been devised for use by front-line health professionals to help indicate those who may be high risk (Morgan, 2000) use recognised demographic and clinical factors, as described above. However, in those with little past history of interaction with mental health services, these are less useful.

I believe that I may be able to enhance my ability to identify high risk individuals if I could personalise this risk assessment to include objective data on the individual’s neurocognitive profile. We know that the evidence links certain neuropsychological traits (impulsivity, impaired decision-making) to self-harm per se. If I can demonstrate that understanding an individual’s neurocognitive profile will likely help to predict future risk of self-harm (the aim of this dissertation), then it may be possible to implement quick and non-specialist neuropsychological tests into a standard post self-harm risk assessment, combining neurocognitive variables to demographic and clinical variables, to improve clinical risk prediction. For patients and their relatives, this could mean that fewer patients would be admitted to hospital unnecessarily and that fewer patients who need intensive support would be discharged home without this.

**Aims and objectives**

**Aim:**
To identify potential neurocognitive factors that may predict repetition of self-harming behaviour in adults

**Objectives:**

1) Identify imaging and non-imaging studies that assess neurocognitive factors associated with recurrent self-harming behaviour compared to those who self-harm once

2) Identify imaging and non-imaging studies that assess neurocognitive factors associated with current self-harming behaviour / ideation in those with previous history of self-harm compared to those with history of self-harm but no current behaviour or ideation

3) Identify studies that simultaneously assess neurocognitive factors and prediction of self-harming behaviour not covered in objectives 1 and 2 above

4) Collate and synthesise data from objectives above to draw conclusions about existing evidence base
Study design
This dissertation will be in the form of a quantitative systematic review. A quantitative approach is appropriate because during this dissertation we will be testing theories and hypotheses using a deductive research method (Bowling, 2009). A systematic review is the highest level of research evidence as it systematically collects all the relevant literature for synthesis using statistical techniques as appropriate (Cunningham et al., 2013). This allows the research question to be answered with a “uniform conclusion” (Cunningham et al., 2013).

All study types that meet inclusion criteria will be considered. We will aim to follow appropriate systematic review guidelines as recommended in the Cochrane Handbook for studies of different types (Higgins JPT & Green S, 2011).

Rationale for methodological approach
Particular neurocognitive factors, such as decision-making, impulsivity and sensitivity to emotional feedback, have been linked to self-harm (Oldershaw et al., 2009; Giegling et al., 2009; Jollant et al., 2008). However, it is less certain if we can apply these correlates clinically: that is, use assessment of these factors in an individual to predict the risk of future self-harm. Therefore, it is important to have a clear understanding of the scope of the existing literature and to what extent neurocognitive factors and repetition of self-harm have been examined together. To my knowledge, a synthesis of the non-imaging and imaging data in this area has not been published, and so a systematic review would seem appropriate.

Appropriateness of methodological approach
I performed a brief scoping exercise to ensure that my planned methodological approach was appropriate to answer the research aim. On 17/9/14, draft search strategy (self harm or self-harm or suicid*) and (repet* or repeat* or persist* or predict*) and (decision-making or decision making) or (impulsiv*) in PubMed resulted in 568 hits. I reviewed 100 of these, 39 of which appear relevant to the topic area, and 8 likely meet inclusion criteria appraising the abstract alone. This search strategy is not comprehensive, particularly as it only involves two different neurocognitive factors and one database search, but it indicates that there will be sufficient studies to conduct a systematic review.

Methods
The systematic review will be conducted using the following inclusion criteria to structure the systematic search for appropriate published data using multiple databases.
Participants:
All adolescents and adults (13+) not restrictive of any diagnosis of mental illness or none

Exposure: 1 and / or 2

1) Multiple episodes of self-harm
2) Current suicidal ideation or episode of self-harm on background of history of self-harm

Self-harm is defined as harm to self by deliberate use of any or multiple methods, including but not limited to:

- Cutting to include blood-letting
- Poisoning or misuse of prescribed medication
- Hanging
- Immolation
- Motor vehicle accident
- Fire-setting
- Deliberate self-neglect leading to physical injury

Suicidal ideation includes recurrent thoughts of harming self deliberately by any method or no particular method for at least 2 weeks (as per ICD-10 as part of depressive disorder (WHO, 1994))

Comparator 1 and/or 2

1) Single episode(s) of self-harm
2) No current suicidal ideation or current episode of self-harm on background of past self-harm

Outcome:
Examination findings of one or more assessments of neurocognitive functioning (i.e.) decision making, impulsivity, sensitivity to emotional feedback etc.

To include but not limited to:

- Interview
- Questionnaire
- Off-line neuropsychological testing
- Imaging neuropsychological testing
**Study type**
No restriction on study type as long as fulfils PECO inclusion criteria with no exclusions as defined above

**Inclusion and exclusion criteria**

### Inclusion criteria

<table>
<thead>
<tr>
<th>Participants are adolescents and adults 13+ with any or no mental illness</th>
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<tbody>
<tr>
<td>Exposure is multiple episodes of self-harm; or current suicidal ideation or self-harm on background of past self-harm</td>
</tr>
<tr>
<td>Comparator is first episode of self-harm; or no current suicidal ideation or recent self-harm on background of past self-harm</td>
</tr>
<tr>
<td>Outcome is examination findings of one or more assessments of neurocognitive functioning (i.e.) decision making, impulsivity, sensitivity to emotional feedback etc.</td>
</tr>
</tbody>
</table>

Any study type

- Studies that simultaneously assess neurocognitive factors and prediction of self-harming behaviour not covered above will also be included (as long as not meet any of exclusion criteria below)

### Exclusion criteria

<table>
<thead>
<tr>
<th>Participants involve children &lt;13 (unless data can be removed separately)</th>
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<tbody>
<tr>
<td>A “current” episode of self-harm greater than 1 month before recruitment to study</td>
</tr>
<tr>
<td>“Current” suicidal ideation not present at time of recruitment to study</td>
</tr>
<tr>
<td>Outcome assessment involving demographics without neurocognitive assessment</td>
</tr>
<tr>
<td>Outcome assessment involves clinical factors without neurocognitive assessment (i.e.) details of self-harm methods, mental illness diagnosis, current mental state</td>
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### Analysis

a. Perform quality assessment on included studies (using checklists appropriate to study type)
b. Review and critically appraise included studies
c. Synthesise data from included studies
d. Identify to what extent this analysis can address research aim
Proposed method of data synthesis:

Group included studies into individual neurocognitive factors (e.g.)

1) Decision making
2) Impulsivity

And then subdivide into

1) Studies addressing objective 1 (recurrent self-harming behaviour Vs single episode)
2) Studies addressing objective 2 (current suicidal ideation / self-harming behaviour in those with history of self-harm Vs no current suicidal ideation / self-harming behaviour with history of self-harm)
3) Studies addressing objective 3 (simultaneous assessment of neurocognitive functioning and prediction of self-harm, but not covered in objective 1 or 2)

If sufficient data, subsequent subdivisions may include

1) Imaging studies Vs. Non-imaging studies
2) Different pre-existing mental illness diagnoses Vs. no pre-existing mental illness diagnosis

Data synthesis is likely to occur narratively as the search will result in included studies with heterogeneity in terms of study type and methods. This is appropriate as we are trying to assess the existing evidence base for neurocognitive factors in repetition of self-harm, howsoever this is investigated.

Search strategy

Using MeSH and textword terms

- Medline
- Embase
- PsychINFO
- CINAHL
- The Cochrane Library
- Web of Science
- References of appropriate review articles
- Hand search relevant journals
Ethics
No ethical approval will be required for this systematic review as it is an analysis of pre-existing data already in the published domain. There will therefore be no threat to the wellbeing of human subjects as part of this research.

Timescale
From February 2015 until submission of the dissertation, I will be undertaking an academic placement for 3 days per week. Therefore, the bulk of the work towards this dissertation will take place during this time.

Tasks:

<table>
<thead>
<tr>
<th>Task</th>
<th>Time</th>
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<tbody>
<tr>
<td>Devise appropriate search strategies for each database and perform database searches</td>
<td>February 2015</td>
</tr>
<tr>
<td>Screen in / out results using inclusion and exclusion criteria by studying titles and abstracts from database searches</td>
<td>March 2015</td>
</tr>
<tr>
<td>For studies screened in using titles and abstracts, obtain full text of article (may need to use library)</td>
<td>March 2015</td>
</tr>
<tr>
<td>Determine studies for inclusion by studying full text using inclusion and exclusion criteria</td>
<td>April 2015</td>
</tr>
<tr>
<td>Perform quality assessment on included studies</td>
<td>May 2015</td>
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<tr>
<td>Extract data from included studies</td>
<td>May 2015</td>
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<tr>
<td>Analyse and synthesise data as appropriate from included studies</td>
<td>June 2015</td>
</tr>
<tr>
<td>Write up first draft of systematic review (add results and discussion to background and methods from protocol)</td>
<td>July 2015</td>
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<tr>
<td>Iterative process of reviewing drafts and incorporating supervisors comments</td>
<td>August 2015</td>
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<tr>
<td>Submit dissertation</td>
<td>September 2015</td>
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Resources
Time in order to undertake the dissertation will be provided by academic training time owed to me as a clinical academic trainee (7 months full time equivalent starting from February 2015). This academic training time is funded by an NIHR Academic Clinical Fellowship.

IT resources from the University of Warwick, to include:
- Access to databases and search results
- Access to EndNote programmes to allow storage and sorting of all database results

Library resources
- Support with constructing appropriate database searches if required
- Support obtaining full text access of articles if required

Likely benefits of proposed research
The aim of this dissertation is to demonstrate to what extent neurocognitive factors can be used to predict risk of future self-harm. From this dissertation, I would like to be able to demonstrate that possession of a set of particular neurocognitive traits may make an individual particularly high risk. As discussed in the personal context of this dissertation, if I am able to demonstrate this, we may be able to enhance risk assessments of self-harm with the inclusion of objective data on an individual's neurocognitive profile. For health care professionals, this could mean improved clinical decision making – increased confidence in our assessments and reduced stress. For patients and their relatives, this could mean that fewer patients would be admitted to hospital unnecessarily and that more patients who require high levels of appropriately tailored support after an emergency presentation with self-harm or suicidal ideation would receive it. Early intervention after a first episode of self-harm or suicidal ideation may likely reduce the risk of these patients repeating self-harm and / or requiring longer term support from mental health services.

However, any potential progression from the results of this dissertation to a clinical application of a risk assessment tool will be a significant piece of work requiring multiple elements. If the results of this dissertation are partially equivocal or show a gap in the evidence base then further studies looking at these particular areas will be required. In particular, it is possible that the evidence involving longitudinal work will be sparse as these are the most complicated and expensive studies to perform. Following this stage, clinical application studies would assess which neurocognitive tests would be best suited for a standardised post self-harm risk assessment tool. The finalised tool would then require validation and reliability studies to ensure that it is actually testing what we believe it to be testing and that different assessors are able to produce the same results in the same patient.
Dissemination
Publication and conferences: I plan for this dissertation to be of an appropriate rigour and standard that it would be publishable in a peer-reviewed journal. Appropriate possibilities may include: British Journal of Psychiatry, Biological Psychiatry, Translation Psychiatry, BMC Psychiatry. I also will consider a submission as a potential presentation to the Royal College of Psychiatrists International Congress. These journals and conference would appear to be the most appropriate as they cover Psychiatry from a neuroscience / biological perspective, which is the topic of this dissertation. I am aware that in order for publication of this dissertation to be achievable, I will likely need my methods (screening and inclusion / exclusion criteria) to be duplicated by a colleague after submission of this dissertation.

Targeted dissemination: Following completion of my dissertation, I will consider whether it is appropriate to approach self-harm / suicide charities and third sector organisations with the findings.

Local dissemination: I will plan to present my findings locally to my place of work (a mental health service trust) and to my clinical academic colleagues (at the Warwick Integrated Clinical Academic Trainee meeting)

References


