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Mental health and wayfinding

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Abstract

Wayfinding uses a range of skills including recalling information from memory, interpreting information from the environment, and taking decisions based on this information. Mental health conditions such as anxiety or depression can adversely affect these skills. A significant proportion of the population has one or more mental health conditions. This paper discusses the issues that these people face when wayfinding. It is based on a descriptive study which uses the results from an on-line survey of domestic travel by people with mental health conditions. The anxieties associated with wayfinding such as feeling disorientated and becoming lost are examined. The roles that mobile phone apps and information play in wayfinding are discussed. Many of the respondents indicated that initiatives such as clearer information about bus and train services, the provision of information on board buses and trains and travel training would encourage them to travel more.

Highlights

- Wayfinding requires a variety of skills including obtaining information from the environment and from memory and using it to make decisions.
- Mental health conditions can affect these skills.
- The results of an on-line survey show the various anxieties associated with wayfinding including disorientation and fear of getting lost.
- Clearer information about buses and trains would encourage many of the respondents to travel more.
- Many respondents in the survey used mobile phone apps to assist with wayfinding, particularly Google Maps.

Key words: anxiety; mental health; wayfinding; memory; decision-making; apps

1 Introduction

The World Health Organization (WHO) (2015) regards mental illness as one of the greatest public health challenges in Europe in terms of the burden of disease and prevalence, a major cause of disability and a significant economic burden. Mental wellbeing is influenced by the nature of the environment, both physical and social (Kearns and Moon, 2002; Wild et al., 2021). Transport is part of the environment offering the means to access opportunities that enhance life and provide the income to enjoy them and so can contribute positively to mental health (Reinhard et al., 2018; Whitley and Prince, 2005). It can also have negative effects through the stress of making journeys (Evans and Wener, 2006, 2007) and through externalities such as noise, pollution and community severance (Anciaes, et al., 2016; Mackett and Thoreau, 2015). These links mean that there is a strong association between transport and mental health.

All journeys use some form of wayfinding (or navigation) to reach the desired destination. This is a very complex process (Farr et al., 2012), requiring decisions to be made using information either recalled from memory or obtained during the journey (Mackett, 2017). Some people have mental health conditions that affect the mental skills used when wayfinding. For example, anxiety can affect concentration and self-confidence, and depression can affect the ability to make decisions (NHS, 2021).

In 2018, in the US, 19.1% of adults aged 18 or older, had a mental health condition (U.S. Department of Health and Human Services, 2020). About a quarter of the population of England have been diagnosed as having one or more condition such as anxiety or depression and another 18% have experienced such a condition without a formal diagnosis (Bridges, 2015).

This paper discusses the issues that people with mental health conditions face when wayfinding. It is a descriptive study which uses the results from an on-line survey of people with mental health conditions. The paper concludes with a discussion about the implications of various ways of helping to address the anxieties associated with wayfinding.

2 Literature review

The focus of this paper is the issues faced by people with mental health conditions when wayfinding. The diagnosis of such conditions can be difficult because of the lack of physical symptoms and because co-morbidity with other health conditions, both mental and physical, is common. Another complication is that some negative aspects of mental health are common, and only become a serious problem when the condition is severe. For example, anxiety is one of the most common mental health conditions (Bridges, 2015), but feelings of anxiety can also affect anybody in a situation that they find challenging (Felman, 2020). Recurring intrusive anxious thoughts which interfere with ordinary functions in life may be diagnosed as an anxiety disorder (Felman, 2020). Many people with anxiety also suffer from depression (World Health Organization, 2020).

There are several types of anxiety disorder (NHS, 2021):

- Generalised anxiety disorder;

- Panic disorder which is a condition where the person concerned has recurring, regular panic attacks;
- Social anxiety disorder can make people fearful of certain social situations due to a fear of negative judgment, embarrassment, or rejection;
- Phobias which are extreme or irrational fear of something;
- Agoraphobia is a group of phobias related to situations such as leaving home, being in crowds or travelling alone;
- Obsessive compulsive disorder (OCD) which involves unwanted thoughts or urges, and repetitive behaviours;
- Post-traumatic stress disorder (PTSD).

Depression can be part of several mental health problems, such as bipolar disorder personality disorders and schizoaffective disorder (Mind, 2021).

Anxiety has a number of symptoms including difficulty making decisions and being forgetful. It can lead to changes in behaviour including being worried about being in new situations and can lead to avoidance of places and situations that stimulate anxiety (NHS, 2021). The symptoms of psychological depression can make thinking, concentrating and decision-making difficult (American Psychiatric Association, 2021; NHS Inform, 2021). All these symptoms can affect route choice and wayfinding.

Research has been carried out into the mental processes used when wayfinding. Carmien et al. (2005) concluded that regular travellers on public transport use personally meaningful artefacts such as landmarks and local experience for navigating whereas infrequent travellers rely on abstract navigation artefacts such as maps and timetables and general knowledge about how systems function.

The importance of landmarks in wayfinding has been demonstrated by several researchers. In their work in Venice, Dennis et al. (1999) found that landmarks had an important role to play at the approach to critical nodes where an orientation problem had to be solved, but that only a small subset of the possible landmarks were used in producing descriptions of a route. As well as the importance of landmarks, Lovelace et al. (1999) concluded that people can manage quite complex instructions that are given in writing, but that when given orally, the directions need to be concise. In their study in Loughborough in England, May et al. (2003) presented the participants with a series of complex pedestrian routes. They were asked to identify in detail the information that they felt a pedestrian unfamiliar with the area would need in order to navigate those routes successfully.

The research outlined above suggests that landmarks are useful in finding the way, and that many people have an innate way of finding their way based on experience that is independent of their level of familiarity with the local area. This implies a need to be able to remember and recall information, linked with an ability to interpret the surrounding visible environment.

Since the research discussed above was carried out, wayfinding has been revolutionized by the development of on-line travel information that can be accessed through websites and 'apps' (short for 'applications') on computers, tablets and mobile phones. This information can be used both for journey planning prior to travel and, on mobile devices, for wayfinding when travelling. The latter relies on GPS (Global Positioning System) technology, which can provide information about the location of the user, landmarks and vehicles such as buses, by using data provided free of charge from satellites funded by the US Department of Defense.

This field has grown immensely in recent years (Lyons, 2020), particularly Google Maps¹ which shows routes by car, public transport, taxi, walk and bicycle, the arrival times of trains and buses in real time, and volumes of traffic on roads. It can be used as a sat nav (satellite navigation) system when travelling including when walking, providing audible and visual information. It can also, through Google Street View, provide photographic images of streets which enables potential travellers to make themselves familiar with their route in advance and know what landmarks to look out for on the journey.

Wang and Warboys (2016) have carried out research comparing the knowledge gained following a route in London by participants using three different methods to obtain guidance: Google Maps, 'Legible London' street signs (Applied Wayfinding, 2020) and led by a guide. The participants were asked to walk the route by relying on the knowledge that they had gained previously, and then to sketch the area that they had been walking through. The participants were found to be aware of different aspects of the local environment used in wayfinding, depending on the type of guidance received initially.

Vaez et al. (2019) carried a study in Brisbane using students who were unfamiliar with the study area. The participants used three different guidance methods: Google Maps, paper maps and street signs. They found that the method used affected the choice of wayfinding strategy. Those who used Google Maps tended to ignore observable environmental information such as crowds and stick to the suggested route rather than divert from it.

As well as factors used to plan and follow a route, travellers may need to consider other aspects of a public transport journey in order to complete it. Hunter-Zaworski and Hron (1993) identified the following tasks in making a bus journey:

- The ability to evaluate what is needed to make the journey including route and fare information;
- Understanding the system, including learning routes, stops and transfer points, and understanding the timetable and fare system;
- Accessing the correct vehicle which requires recognising it and processing information about the route number and destination;
- Entering the vehicle including paying the fare;

¹ See <https://maps.google.com/>.

- Travelling on the vehicle;
- Leaving the vehicle including knowing where to alight and when the vehicle is approaching the stop;
- Leaving the stop or station.

Public transport journeys may include decisions about the type of ticket to obtain, where to sit on a bus or train and how to continue the journey if it is disrupted by exogenous circumstances or the traveller feels unwell (Mackett, 2017). On many journeys, particularly by bus, rail or taxi, it is necessary to interact with members of staff. It is often possible to buy public transport tickets from machines or use a pass. However, there may be occasions during any journey when it is necessary to interact with a member of staff. Examples include obtaining information, random checks for revenue protection purposes, and service disruptions.

Car driving requires a similar but slightly broader range of skills because the traveller is in direct control of the vehicle and may need to take sudden action, absorb the relevant information, and act upon it. Vichitvanichphong et al. (2015) undertook a literature review that identified the cognitive abilities associated with driving that include the decision about whether the driver is in a fit state to drive, processing and interpreting visual information about where objects are in space and the mental flexibility to cope with complex situations with confidence.

Summarising the information above, four mental skills used in wayfinding can be identified:

- **Memory:** wayfinding requires the recall of information obtained previously, for example the route to the bus stop, which bus to catch and where to alight;
- **Comprehension:** the ability to understand information from explicit sources during the course of the journey such as direction signs, electronic screens and people, by interpreting the landscape, such as landmarks, and using intuition, such as having a sense of direction;
- **Decision making:** the ability to process information and to make decisions based on it, for example, whether to turn left or right, deciding when to indicate to the driver to stop the bus and deciding how much time to allow for interchange;
- **Interpersonal communication:** the ability to understand others and convey information to them, for example, buying a ticket, asking for assistance, and understanding requests from other passengers. This may be necessary to obtain wayfinding information. A desire to avoid interpersonal communication may affect the choice of route and so influence wayfinding.

Mental health conditions can affect these mental skills, making wayfinding more challenging. For example, anxiety can affect wayfinding by causing navigation errors (Hund and Minarik, 2006). Lawton (1996) found that, as spatial anxiety increased, the accuracy of pointing at landmarks that were not visible, decreased. There is evidence that people who are anxious tend to rely on directional signs rather than landmarks to find the way (Su et al., 2021). One of the reasons for

anxiety when wayfinding may be time pressure. In a study based on forty students in a laboratory, Brunyéa et al. (2017) found that time pressure increased the use of more familiar routes. Brown et al. (2020) came to similar conclusions using VR (virtual reality) environments to examine wayfinding behaviour and found that stress disrupted cognitive control and memory during route planning.

Several researchers have looked at the reasons for wayfinding anxiety: Lyons et al. (2018) concluded that anxiety about wayfinding is related to navigation ability, both actual and perceived. There is evidence that it may be associated with experience during childhood in terms of being allowed out to explore the environment (Lawton and Kellai, 2002; Vieites et al., 2020). Montello and Sas (2006) found that disorientation episodes can generate anxiety, frustration and delay, leading to cognitive dissonance in the wayfinding process. Wayfinding ability can be affected by a number of factors such as individual orientation skills, confidence in interpreting the local environment and anxiety control (Bonfanti et al., 2017). Chang (2013) found that the level of anxiety was significantly positively correlated with the traveller's perception of the difficulty of wayfinding. However, Saucier et al. (2002) found that spatial anxiety was not related to wayfinding efficiency. Perceived lack of competence at wayfinding can have adverse effects on individuals' subjective well-being (Cheng, 2019). Wayfinding can be made more challenging by various co-morbidities. For example, dyslexia affects reading and writing skills (British Dyslexia Association, undated) which can affect various aspects of wayfinding, particularly at interchanges, causing the traveller to feel lost (Lamont et al., 2013).

There are various ways of coping with stress related to wayfinding. In interviews with people with mental health issues, Penfold et al. (2008) found that planning journeys helped to reduce anxiety because being unclear about journey length, the route and connections added to the anxiety of making a journey and using public transport. Planning was particularly important for new journeys being made. Qing et al. (2021) found that using a wayfinding app reduced reliance on wayfinding signs and travel anxiety but did not significantly reduce travel time.

The complexity of wayfinding required to make a journey may be increased by anxieties about other aspects of travel. Posner and Sharp (2020) found that some people with mental health conditions tended to avoid certain modes of travel and environments or travel at certain times of day which could affect their choice of route. Specific examples of issues that people with mental health conditions found challenging when travelling by bus were overcrowding and the complexity of some information at bus stops (Mental Health Action Group, 2011). These might well cause people to take other modes or routes with implications for wayfinding.

Summing up, the evidence in the literature suggests that wayfinding requires the use of mental skills such as memory, comprehension and decision-making. These can be adversely affected by mental health conditions. Anxiety can make wayfinding more challenging by causing navigation errors, particularly when under time pressure. The effects of anxiety in wayfinding can be mitigated by planning journeys in advance and using mobile phone apps. These and other aspects

of wayfinding by people with mental health conditions are explored in this paper using the results of the survey described in the next section.

3 Methodology

3.1 The questionnaire

A survey of people with mental health conditions to obtain information about the sort of issues discussed above was carried out in 2018 (Mackett, 2019). The questionnaire was designed using advice from experts in the fields of transport and mental health. It contained forty-two questions covering the following topics:

- The mental health of the respondent;
- The effects of the respondent's mental health on travelling;
- Bus travel;
- Rail travel;
- Travel by car;
- Walking;
- 'Please off me a seat' badges;
- Travel training;
- Use of mobile phone apps;
- Employment;
- Information about the respondent.

Thirty-six of the questions had pre-defined answers to be ticked, including, where relevant, 'Other' with a space to explain. There were six open-ended questions such as one asking people who had indicated that their mental health condition had led to them becoming lost, experiencing severe anxiety or needing to seek help when travelling to explain what had happened. This meant that a mixed methods approach was adopted in the study, collecting both quantitative data to indicate the scale of the issues and qualitative data to illustrate the nature of the complex issues faced by some people with mental health conditions when they travel. Informal testing of the questionnaire suggested it would take about ten minutes to complete unless the respondent chose to write large volumes of text.

3.2 The conduct of the survey

Approval for the survey was given by the UCL Research Ethics Committee. The questionnaire was coded using Opinio software. The survey was carried out by distributing a link to the on-line questionnaire through eighteen organizations in Great Britain associated with mental health or transport plus three individuals with a range of suitable contacts. They distributed the link using social media, blogs and websites. The respondents could be anywhere in the country. The questionnaires were completed anonymously to encourage the respondents to answer frankly which they might not have otherwise done because of the stigma associated with mental illness (Public Health England, 2015). This meant that it was not practical to carry out a pilot survey because it would have had to be carried out in the same way as the full survey which might have

led to the questionnaire going to some people twice which might have caused them distress and confusion. No incentives or compensation were offered for participation. The organizations who distributed the link to the questionnaire were asked to distribute a link to the final report in the same way so that the survey participants could see the work that they had contributed to.

A total of 389 responses were received. Of these, 385 were from people who gave a positive response to either 'Do you have a mental health condition?' or 'Are you a carer for a person who has a mental health condition?' who were included in the survey.

3.3 The weighting of the sample

Because the survey was carried out online, it was not possible to control the age and gender profile of the respondents to ensure that it matched that of the population with mental health conditions in the whole country. To address this issue, the results have been weighted using figures from the latest Adult Psychiatric Morbidity Survey (APMS) (McManus et al. 2016). Weightings were applied to the age-gender cohorts in the survey sample based on the number of people in those cohorts in APMS who had a mental health condition². This meant that questionnaires from respondents who did not indicate their age or gender had to be ignored, leaving 363 responses which form the basis of the discussion in this paper.

The respondents were asked to indicate which of eight age groups they belonged to. When the data were examined, it was found that the number of respondents in the age groups Under 18, 71-80 and 81+ were very small and tended to have a disproportionate impact on the weighted results. To address this issue, these age groups were combined with the adjacent ones.

3.4 The characteristics of the sample

The demographic structure of the sample used in the analysis is shown in Table 1. The table also shows the number of people in each age and gender group in the original sample. Comparison of the two sets of figures suggests that males and older people were under-represented amongst those responding to the questionnaire compared to the national profile shown in APMS. The average age of the weighted sample is 42.4 years (SD = 15.9), with the males slightly younger (average age 41.8, SD = 15.2) than the females (average age 42.8, SD = 16.3). The effects of weighting the sample to reflect the demographic structure in APMS is illustrated by the fact that

² The two most recent surveys of mental health in England are the Adult Psychiatric Morbidity Survey 2014 (APMS) and the Health Survey for England for 2014. The Health Survey for England (Bridges 2015) is carried out annually but some topics such as mental health are only included occasionally. Mental health was last included in 2014. In that survey, the respondents were given a list of 17 different mental health conditions and asked to say which of these they had ever experienced. This means that people who had had a mental health condition but had recovered would be included. Older people are more likely than younger people to have had a mental health condition during their lifetime simply because they have lived longer. In contrast, APMS considered the current state of the mental health of the participants and so is closer to the question asked in the survey being considered in this survey. The respondents in APMS most similar to those in the survey being considered in this paper were those whose score on the Clinical Interview Schedule (CIS-R) indicated that they had symptoms of anxiety and depression at a level likely to benefit from acknowledgement and possible intervention.

the average of men in the original sample was 43.7 years (SD = 13.4), and that of females was 36.9 (SD = 13.1), with an overall average age of 38.6 years (SD = 13.5).

Table 1 The demographic structure of the sample

	< 31	31-40	41-50	51-60	61+	Total	<i>Unweighted sample size</i>
Male	34	29	29	19	20	131	91
Female	66	38	46	38	45	232	272
Total	100	67	75	57	65	363	363
<i>Unweighted sample size</i>	107	98	80	56	21	363	363

All percentages in the following tables are for the weighted sample. The unweighted sample size is also shown for the respondents who are being included in the analysis.

The respondents were asked the question ‘Do you have any of the following mental health conditions:’ followed by a list for them to tick as many as were relevant. This is the same approach as used in the Health Survey of England (Bridges, 2015). The percentages with each mental health condition are shown in Table 2. All the respondents had at least one mental health condition, and most had several. The majority had either anxiety or depression or both.

Table 2 Mental health of the respondents in the survey

	% of respondents	<i>Unweighted sample size</i>
Anxiety (including social anxiety and panic attacks)	89	327
Depression	76	244
Post-traumatic stress disorder (PTSD)	20	74
Obsessive-compulsive disorder (OCD)	14	61
Agoraphobia	13	48
Bipolar disorder	7	27
Other conditions	24	80

Total number of respondents: 363

The respondents were asked ‘Have you used any of the following forms of transport in the past year?’ followed by a list where they could tick all that applied. They were then asked, ‘Does your mental health condition prevent you from using any of the following types of transport?’ followed by the same list for them to tick. The results are shown in Table 3. It is noticeable how many more of the respondents have been car passengers than car drivers. 30% of the respondents were not able to drive. In some cases, this was because they were not permitted to drive because of their mental health condition (Driver and Vehicle Licencing Agency, 2021). In other cases, they may have chosen not to drive because of anxiety about doing so. Slightly more

could not use bus or train, and even more could not travel by metro. The inability to use certain modes would influence route choice for some journeys and so affect wayfinding.

Table 3 Modes of travel used by the respondents

	% of respondents who had used the mode in the previous year	% of respondents who were not able to use the mode of travel	<i>Unweighted sample size for mode used</i>	<i>Unweighted sample size for modes that could not be used</i>
Walking	87	10	323	31
Being a car passenger	86	9	312	33
Bus	73	30	266	114
Train	73	29	267	114
Taxi	57	16	223	60
Driving a car	47	30	161	105
Metro	44	36	161	136
Tram	21	20	85	72
Cycling	18	17	68	58

Total number of respondents: 363

4 Results

4.1 How wayfinding causes anxiety

Respondents were asked ‘When you go out, are you anxious about any of the following’. They were offered a list of fifteen factors, plus the opportunity to write down other factors that were not on the list. All except four out of the 363 respondents indicated one or more anxiety that have when they travel, and three of those four said that they suffered from anxiety of some form.

Overall, 67% of the respondents had anxieties related to aspects of wayfinding. These were spread across various aspects of wayfinding, as shown in Table 4. The overall figure was fewer than the numbers who had anxieties about interacting with fellow travellers (84%) and the need for support when travelling (82%). It was more than the number concerned about the need to take action urgently (63%) and about having to interact with staff and purchase tickets (51%). Some of the other anxieties might affect the route taken such as the need to be close to suitable toilet facilities or places where support could be obtained, or influence the mode taken, such as avoiding modes that could lead to claustrophobia or required interaction with a member of staff to buy a ticket. These routes may have required more complex wayfinding than the routes being avoided.

Table 4 Aspects of wayfinding that cause anxiety

Aspects of wayfinding	% of respondents affected	Unweighted sample size
Feeling disorientated	46	165
Getting lost	36	134
Having to take decisions about where to go	35	130
Remembering where they are going to	19	66

Number of responses: 359

As Table 4 shows, the aspect of wayfinding causing most anxiety was feeling disorientated, followed by getting lost and having to take decisions about where to go.

4.2 Experiencing anxiety when wayfinding

The respondents were asked ‘Has your mental health condition ever led to you becoming lost, experiencing severe anxiety or needing to seek help when travelling’ and if this had happened, they were invited to explain what had happened. Many of the respondents gave examples. These examples help to illustrate the complexity of the wayfinding process, particularly for people whose mental skills may be impaired. For example, having an impaired memory may affect wayfinding, both in terms of remembering the destination and making decisions on the way. This condition was reported by 45% of the respondents. One man aged 51-60 described how this affected his wayfinding ability: *“I have a combination of dyslexia and anxiety. I readily make mistakes reading and remembering (accurately) timetable information, directions and so on. This leads me to make mistakes that can leave me in the wrong place, or very late or sometimes a day early!”* As explained in Section 2, dyslexia can affect reading skills, which would have caused the difficulty reading the timetable and directional information, contributing this man becoming lost, causing anxiety. Others needed to call for help: *“When visiting a friend I had been to see several times before, I forgot the way and got lost and her partner had to come and get me”* (Woman aged 41-50). This is another example of wayfinding made difficult because of memory impairment.

Some people felt the need to keep checking whether they were taking the correct route: *“Manically checking the journey, where I am, if I am where I should be, on the right bus or train or road. Constant state of raised awareness/hyper awareness gets exhausting”* (Woman aged 51-60).

Taking the wrong bus or train was a concern for some of the respondents: *“I don't get public transport alone. I worry that I would get on the wrong train/bus or it might be delayed, or I wouldn't be able to get back home”* (Woman aged 31-40).

Some of the respondents gave examples of feeling disorientated. For example, a woman aged 31-40 said: *“Get depersonalisation which means I totally lose orientation and sometimes can't speak”*. Another woman, aged 41-50, explained: *“I went to vote in the recent local elections. Even though I researched how to get there I became disorientated and started getting really scared so*

I turned back and came home". Disorientation may occur because of a change of layout, for example: *"When London Bridge [station] was being refurbished I could not use it at all because the changed layout added to my existing experience of disorientation in mainline stations"* (Woman aged 41-50).

A number of respondents gave examples of how they became lost: *"I was 'lost' in my local town. I didn't know where I was or how to get home"* (Woman aged 51-60) and *"I have extremely poor navigation annuity and when I get lost I panic and cry. A lot. And when I panic I lose the ability to speak, which makes things worse"* (Woman aged 31-40).

The figures in Table 4 and the quotations above illustrate how some people with mental health conditions have difficulties wayfinding. More detailed aspects of wayfinding and ways of addressing some of the issues are discussed below.

4.3 The use of apps

The respondents were asked 'Do you use mobile phone apps to help you when you are travelling?'. Of the respondents, 65% said that they did so, meaning that 35% did not. As discussed above, 67% of the respondents had anxieties about wayfinding so these figures imply that having a mobile phone with wayfinding apps does not address all the anxieties around wayfinding.

There is some variation in the use of mobile phone apps when travelling across the respondents who have the various anxieties associated with wayfinding, as shown in Table 5. None of the anxieties shown seem to lead to more people using mobile phone apps when travelling. Fewer of the people who have anxiety about feeling disorientated than the overall sample use apps when travelling. This may be because they find looking at a phone when travelling increases their feelings of disorientation.

Table 5 Use of mobile phone apps by people with anxieties about wayfinding

Aspects of wayfinding causing anxiety	% of respondents	Unweighted sample size
Feeling disorientated	59	165
Getting lost	65	134
Having to take decisions about where to go	62	128
Remembering where they are going to	65	66
All	65	359

There was a wide variation in the use of mobile phones for wayfinding across the age spectrum as shown in Table 6. There is a clear decline in the use of apps with increasing age from 83% of those under 31 to 38% of the respondents aged over 60. There was less difference between the genders with 68% of males and 63% of females saying that they use them.

Table 6 Respondents who use mobile phone apps when travelling

Age	% of age group who use mobile phone apps when travelling	<i>Unweighted sample size</i>
< 31	83	106
31-40	78	97
41-50	61	79
51-60	54	56
61+	38	21
All	65	359

They were then asked, 'If you do not use mobile phone apps to help you when you are travelling, please say why not', and were offered the reasons shown in Table 7 to tick. This question was only relevant to the 127 people who did not use mobile phone apps. Of those who answered this question, similar numbers said that they did not own a suitable phone and that they had not found any that met their needs and slightly fewer said that they have found apps too complicated to use. Those saying that they were too complicated to use may not have tried them: they may simply believe that they are too complicated and do not wish to try them. The main reason for older people who did not use them was that they found them too complicated to use (51% of respondents aged over 60) whereas for younger people the largest reasons were that they did not have a suitable phone or had not found any apps that met their needs (30% of those aged 30 and under for each reason).

Table 7 Reasons why some respondents do not use mobile phone apps for wayfinding

	% of respondents	<i>Unweighted sample size</i>
I do not have a suitable mobile phone	29	30
I have not found any that meet my needs	29	44
I find them too complicated to use	23	27
Something else	18	16
Total	100	127

Total number of respondents: 127.

The 65% of respondents who said that they use websites and apps for travel were invited to state which they use and how they help. The most popular was Google Maps used by 44% of them with no other app being used by more than 12% of these respondents.

4.4 The presentation of information

Trips that are carried out frequently, for example, to work, require little preparation in most cases. A new journey may require the assembly of information about routes, times and fares, and then decisions made to determine the optimal package of travel time, cost and convenience. For most people this should not be a problem, but, as the evidence discussed above has shown, some people with mental health conditions find this challenging. Some of them may be able to

overcome the issues with assistance from family and friends, but others may not be able to, or choose not to, obtain such assistance. Hence, travel information needs to be presented in a way that can be understood by people with mental health conditions.

The respondents were asked, ‘Would any of the following encourage you to travel more by bus’, followed by a list of seven alternatives, including ‘Something else’, with a space in which to say what it was and then the same question except that it contained the word ‘train’ instead of ‘bus’. In each case, two of the alternatives offered to the respondents were ‘Clearer timetables and maps’ and ‘Clearer websites’.

The figures in Table 8 suggest that information for planning journeys in timetables, maps and websites is not always as clear as it might be. It shows the numbers of respondents in the survey saying that they would travel more by bus and train if clearer information were provided on timetables, maps and websites. Greater proportions said that such information would encourage them to make bus journeys than rail journeys, possibly because there are more boarding and alighting points and routes for buses than for trains.

Table 8 Percentage of respondents saying that clearer information would encourage them to travel more by bus or train

	Clearer timetables and maps	Clearer websites	<i>Unweighted sample size</i>
Bus	45	30	312
Train	36	25	306

4.5 The provision of in-vehicle information

Several the comments about wayfinding referred to concerns about being on the wrong train or bus or feeling uncertain about when to alight. The respondents were asked two questions about the use of electronic information screens. One was, ‘Do you find that electronic screens on board the bus showing the route and destination of the bus help you when you are travelling’ with four possible answers ‘Yes’, ‘No’, ‘Our local buses do not have this sort of information’ or ‘I do not travel by bus’. The other question was identical except that the word ‘train’ was used rather than ‘bus’. One of the possible answers to the questions discussed in Section 4.4 about factors that would encourage more travel by bus or rail were ‘Clearer information on board the bus (or train) about the route and the next stop’.

As Table 9 shows, having this type of on-board information would encourage more travel, particularly by bus. This difference between bus and rail probably reflects, amongst other things, the lower current provision of such information on buses. It may well also reflect the greater number of stops on a typical bus journey compared with a rail journey and the greater level of information provided on railway stations compared with bus stops. Very few of the respondents said that they did not find it useful to have this information.

Table 9 The usefulness of electronic screens showing route and destination information on board buses and trains (%)

	Bus	Train
I find it useful	53	66
I do not find it useful	3	6
Our local bus/rail services do not have this type of information	25	12
I do not travel by this mode	19	15
Total	100	100
% of respondents who said that on-board information would encourage them to use the mode more	48	33
<i>Unweighted sample size on usefulness of electronic screens</i>	<i>362</i>	<i>359</i>
<i>Unweighted sample size on travelling more</i>	<i>312</i>	<i>306</i>

4.6 Obtaining assistance

Carrying a mobile phone may help to reduce anxieties because it can be used to contact family members or friends for support, for example, to summon assistance when feeling lost which was an anxiety cited by 36% of the respondents. However, there are circumstances when it is useful to speak to a person at the current location to obtain relevant information, for example, about the route to take or when feeling too distressed to use a mobile phone. This might influence the choice of route or mode for people who want to be confident that they will be able to talk to a member of staff, if necessary, which might make wayfinding more difficult. Travellers on public transport can ask a member of staff if they are able to find one and do not feel too anxious to address them. This would probably not apply to the 45% of respondents who said that ‘Having to talk to staff such as bus drivers’ was a cause of anxiety, reflecting the fact that 49% of the respondents reported that their mental health condition caused them communication difficulties. The benefits of being able to access such help was shown by the 18% of the respondents who said that having more places to ask for help would encourage them to walk more and the 42% who said that being able to contact a member of staff when on a train would encourage them to travel by train more.

5 Discussion

A fundamental requirement of travelling alone is having the confidence to set off on a journey, to be able to recall and obtain information, to be able to make decisions using that information and to cope if the unexpected occurs. The wayfinding anxieties that the survey respondents reported are consistent with the effects that mental health conditions have on the mental skills used in wayfinding, as discussed in Section 2.

Various policies and actions can be implemented to help address the issues identified in this paper (Mackett, 2021). One way to increase the confidence to travel is to provide travel training, for example, to help learn about possible routes (Mackett, 2017). This usually involves classroom exercises and journeys with a trainer on a one-to-one basis to provide experience. The

respondents were asked 'Have you ever received travel training, which is where an expert provides training on a one-to-one basis to increase your confidence when travelling?'. Only 3% of the survey respondents had received such training. They were then asked, 'If you have not received travel training, do you think that this sort of training would encourage you to travel more?'. 40% of those who had not, said that doing so would encourage them to travel more. Another factor that might affect the choice of route is access to places where assistance can be obtained which would assist the 34% of respondents who felt anxious about being able to obtain help when travelling. One way to provide assistance would be to set up 'Safe Places' which are shops and offices where vulnerable people can go and seek assistance if they feel anxious while they are travelling and need support immediately (Safe Places National Network, 2020). There a trained member of staff will listen to them and provide advice or contact a family member or friend of the anxious person.

Table 4 shows that 46% of the respondents felt anxious about feeling disorientated. This may be partly due the nature of the urban landscape. Blackman et al. (2003) reviewed the literature on accessibility for people with dementia and found that long, uniform, repetitious streets and buildings frontages could be difficult for wayfinding. The same may be true of some people with mental health conditions. This is consistent with the importance of landmarks for wayfinding discussed in Section 2.

The figures in Tables 8 and 9 suggest importance of clear travel information. The need for simpler signs on the street is illustrated by the fact that 21% of the respondents said that better signposting on the street would encourage them to walk more. There is evidence that on-street maps of the sort used in 'Legible London' (Applied Wayfinding, 2020) are more helpful than finger signposts (AIG, 2006). Clear signposting is particularly important given the evidence that people who are anxious tend to rely on directional signs rather than landmarks to find the way (Su et al., 2021).

There are examples of good practice in providing clear public transport route information such as the 'spider map' of London's bus services (International Transport Forum, 2009). The maps show the bus routes from a particular point in London, including an enlarged area around the trip origin showing where local bus stops are and the public transport routes spreading from it in approximate geographical locations, with key stops shown. These maps are used on bus shelters in London to show the bus routes and locations served by the bus stop.

In Britain, the guidance on inclusive mobility is currently being revised (Jones et al., 2020) and the revision process has included consultation with people with mental health conditions (Posner and Sharp, 2020). Recommendations are made to ensure clear signage for pedestrians including street names, to ensure signs are at a good height and kept clear and to reduce intrusive advertising. There are recommendations about signage on public transport that may help to address some of the issues raised by the respondents: these include improved signposting of information including the location of available staff particularly in trains and bus stations and information about alternative, quieter, well-lit routes. People with mental health conditions

would probably be assisted by the implementation of the recommendation that information, including bus and train timetables and bus and station maps, is presented in a consistent form across all travel systems in the UK.

One of the issues that affected many of the respondents was anxiety about talking to members of transport staff. This may be partly addressed by providing appropriate staff training. The Department for Transport in Great Britain has entered a commitment to ensure that rail and bus staff are given training to assist people with non-visible disabilities, which should make the staff more empathetic to people with mental health conditions (Department for Transport, 2018).

The majority of respondents used mobile phone apps to provide wayfinding information when travelling. This shows that they are useful and reflects the evidence that they can help to reduce anxiety (Qing et al., 2021). Google Maps was the most popular wayfinding app. The popularity of the Google maps app is probably explained by its comprehensiveness, covering all land modes including walking, all parts of the country, availability on the most widely used operating systems, and provision of information both visually and audibly. It can also provide images of the landscape through Google Street View. These features can help to overcome difficulties with the aspects of wayfinding skills (memory, comprehension and decision making) that some people with mental health conditions have. It may also reduce the need for interpersonal communication by providing relevant information. An important issue is that many older people do not have a mobile phone, as shown in Table 6 reflecting the decline in digital inclusion with age (Banks et al., 2016; Matthews et al., 2019). However, internet use by older people is increasing over time (Matthews et al., 2019).

It can be quite challenging to look at a mobile phone screen and to look at the streetscape simultaneously which may be necessary when trying to find the way in an unfamiliar area. Research by Fickas et al. (2008) and a literature review by Livingstone-Lee et al. (2014) both led to the conclusion that the best way to present navigation information is via audio using earphones. Fickas et al. (2008) argue that this is less conspicuous than other methods and so presents a lower risk of drawing attention to vulnerable users. It is not clear from the survey how the respondents used the wayfinding apps. Some of them may not have been aware that Google Maps provides auditory information or that Google Street View can be used to provide familiarity with the visual environment and landmarks prior to and during travel.

Many of the 36% respondents who felt anxious about getting lost used mobile phone apps. This implies that anxiety about becoming lost is not completely obviated by having a mobile phone that shows the route to the destination, shows the user's current location, and allows the user to contact a friend or family member. On the other hand, if mobile phone apps were not available, even more of them might have been anxious about getting lost. A useful finding that came out of the work of Vaez et al. (2019) was that people wayfinding using Google Maps deviated less from the planned route than those using other methods even when it might have been sensible to do so because of what was happening around them such as crowding. Being in crowded environments is a cause of anxiety for some people. Using a mobile phone app for wayfinding

may increase self-confidence when travelling, but if its use leads to failure to take heed of observable environmental information such as crowds, that may cause other anxieties. This suggests that apps like Google Maps need enhancing to allow a wider range of criteria to define the type of route required and more flexible updating of routes after the journey has started. This could include congestion on walking routes as well as on driving routes.

One cause of anxiety when travelling by bus was knowing when to alight. Several apps alert the traveller when the bus is approaching the stop that they wish to alight at have been developed (for example, Barbeur et al., 2010 and Manduchi, 2015). It would be useful if such an enhancement were added to existing popular apps such as Google Maps.

There are ways that wayfinding anxieties could be addressed by introducing interventions of the sort discussed above and reviewed by Mackett (2017). It would be very important that their use is evaluated effectively involving people with anxieties to ensure that, not only do they address the anxieties, but that they do not introduce others.

6. Limitations of the study

The results from the survey reported in this paper provide some interesting evidence of the effects of having a mental health condition on wayfinding, plus discussion about some ways of addressing some of the issues that arise.

Because of the stigma associated with mental illness that might have discouraged some of the respondents from giving frank answers about issues that affect them personally, the survey was carried out anonymously on-line with the link to the questionnaire distributed by third parties with whom potential respondents would already have had some contact. However, this meant that there was no control over who responded. It also meant that respondents had to have access to social media or other forms of on-line access to websites, blogs or newsletters. This may also have meant that the respondents were more aware of mental health issues and more willing to discuss their own health than some other people with mental illness.

It was not possible to ensure that the sample matched the demographic profile of the population with mental illness in the country. Comparison with APMS (McManus et al., 2016) suggested that the sample contained fewer males and fewer older people than the national population with mental illness. The under-representation of men may have been because they tend to be less willing to discuss their mental health than women (RAMH, 2020), and of older people because the questionnaire had to be completed on-line, and digital inclusion tends to decrease in later life (Matthews et al., 2019). This issue was addressed by weighting the sample so that it matched the age and gender profile in APMS. Whilst this technique helped overcome some of the biases in the sample, there are some issues with it. For example, the definition of mental illness in the two surveys is not identical because APMS uses the Clinical Interview Schedule (CIS-R) which is not appropriate for a self-completion questionnaire, whereas this survey used the technique of asking the respondents whether they had a mental health condition, the same method as used in the Health Survey of England (Bridges, 2015). As discussed in Section 3.3, the two most recent

surveys of mental health in England are APMS and the Health Survey of England for 2014. Both were carried out in 2014 which is several years ago but were the best that were available. The relative infrequency of these surveys reflects the difficulty and sensitivity of collecting data on mental health.

The nature of the survey and the convenience sampling method used, meant that it was not possible to carry out a survey of comparable people without mental health conditions. Many of the questions were explicitly about the effects mental health on travel and would not have been appropriate for people without mental health conditions.

The lack of a comparable sample without mental health conditions meant that was not possible to carry out statistical tests to see whether having a mental health condition had a statistically significant impact on wayfinding. This means that this descriptive study should be seen as exploratory, showing that mental health, particularly anxiety, does affect wayfinding and other aspects of travel that may affect route choice.

During 2020 and 2021, the COVID-19 pandemic has had a world-wide impact on many aspects of life including mental health (Pierce et al., 2020). It is not clear how long the effects on mental health will last. One effect of the pandemic has been that people have left home less often, to reduce the risk of catching COVID-19 and because many activities such as work, shopping and education have been carried out at home rather than by making journeys. In this survey, respondents were asked 'Does your mental health condition ever prevent you from leaving home?', with four possible answers: 'Yes, frequently', 'Yes, occasionally', 'Yes, but only rarely', and 'No'. Of the respondents, 31% gave the first possible answer and another 36% gave the second. It seems likely that the pandemic will cause these figures to increase for the reasons given above, but they may go back down as 'normal life' is restored. It is not obvious that the pandemic will affect the anxieties about wayfinding shown in Table 4, but it may affect the modes and routes that people take. For example, some people may choose to travel by car rather than bus or rail and others may make choices such as avoiding crowded places which may require more complex wayfinding. However, even if these and other changes to travel patterns do occur, it seems to be unlikely that the results from the survey shown in this paper will be negated.

7 Conclusions

This paper has shown how some of the symptoms associated with mental health conditions such as impaired memory and difficulty in making decisions, can impair the skills used in wayfinding. The results from the survey discussed here illustrate the range of anxieties that are associated with wayfinding both directly, such as anxiety about getting lost, and indirectly, such as anxiety about having to interact with staff which might affect the route or mode taken. Many of the survey respondents used mobile phone apps such as Google Maps to help them in wayfinding, but even this approach for all its sophistication, does not seem to address all the anxieties. There are other enhancements that might be useful such as an explicit warning that the bus is approaching the bus stop the user wishes to alight at and showing congestion on walking routes.

Given the large proportion of the population who have mental health conditions, there is a strong case for implementing the interventions discussed here. The respondents stated that doing so would encourage them to travel more and so would increase public transport revenue. Feelings of anxiety can affect anybody in a situation that they find challenging. For some people, this may include wayfinding. The findings in this paper, based on evidence from people who explicitly acknowledge having travel anxieties, may be applicable to a much wider population. In addition, the enhancements such as clearer information would also benefit other travellers, potentially increasing revenue further.

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