Physical activity habits and preferences in the month prior to a first-ever stroke

Background: Physical inactivity is a powerful risk factor for stroke and other chronic diseases. The aim of this study was to explore physical activity habits and preferences in the month leading up to a first-ever stroke, and to determine whether participants were aware of the link between stroke and physical activity. Methods: We undertook an observational study with 81 participants recently admitted to a stroke unit. Participants reported their pre-morbid physical activity preferences and habits and completed the Barriers to Physical Activity and Disability Survey. Data were analysed with summative content analysis and descriptive statistics. Results: Only 31% of participants were aware that physical inactivity was associated with stroke. Most participants defined physical activity with examples of instrumental activities of daily living (IADL) and walking (48% of responses), and IADLs constituted their most frequent regular physical activity (38% of responses). The barriers to physical activity reported by participants most frequently were lack of motivation (52%), lack of interest (50%) and lack of energy (42%). Conclusions: Regular physical activity is important to prevent stroke and other chronic diseases but adults at risk of stroke have little awareness of the risks of physical inactivity and little motivation to undertake regular exercise.

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BACKGROUND

Stroke remains the leading cause of serious long-term disability, with direct and indirect costs in the United States in 2009 totalling $38.6 billion and increasing rapidly[1]. It is well established that a healthy lifestyle reduces the risk of stroke by up to 80%, and undertaking regular physical activity (PA) is an important component of this[2]. Physical inactivity is a powerful risk factor for stroke, with a large multi-national case controlled study demonstrating that inactivity is the second greatest risk factor for stroke following hypertension[3]. Despite this, interventions to improve uptake of adherence to PA recommendations have received little research attention, with emphasis instead on controlling risk factors such as hypertension, body mass index, cholesterol and diabetes. While this has demonstrated significant impact on stroke reduction[4], there is still a pressing need to do more to reduce stroke incidence and mortality.

Although the precise amounts and type of exercise required to prevent stroke are unclear, meta-analyses conclude that regular PA reduces the risk of stroke by 25-30% when compared with the least active people[5, 6]. In a telephone survey of residents in the US state of Ohio, only 11% of the 2173 respondents were aware that lack of exercise was a risk factor for stroke[7], with more recent data from Ireland showing a higher proportion (32.5%) but still generally a low awareness[8]. Physical inactivity is occasionally even overlooked by researchers considering important modifiable risk factors for stroke when studying awareness of stroke in the community[9].

Physical activity levels in older adults tends to decline with age, with 40% of US adults aged 65 to 74, and 53% of those aged ≥75, being classified as inactive (not undertaking any light/moderate or vigorous activity of at least 10 minutes per day)[10]. Older adults frequently report poor health, lack of company and lack of interest as the main barriers to PA[11]. Increasing our awareness of the barriers and facilitators to exercise in stroke-free individuals at risk of stroke

40   will enable the targeting of health promotion activities to these groups, particularly those with

41   hypertension, diabetes and previous transient ischaemic attack (TIA).

42   The purpose of this study was to interview people recently admitted to hospital with a first-ever

43   stroke to explore their PA patterns prior to their stroke, whether they were aware of the link

44   between stroke and PA and their understanding of what PA involves. A further aim was to

45   examine barriers and facilitators to PA, in the hope of highlighting which factors may be

46   modifiable and could be addressed to prevent stroke.

47   ## METHODS

48   **Study population**

49   This cross-sectional study recruited adults with first-ever stroke from the acute stroke units of

50   two local metropolitan hospitals. Participants were included if they had a first-ever stroke and

51   were aged 40 to 90 years. Participants were excluded if they had a history of dementia, had

52   receptive and expressive language difficulties which would impact upon their ability to take part

53   in the interview, and were drowsy or otherwise unable to cooperate. All participants gave their

54   informed written consent for the study which was approved by the relevant Research Ethics

55   Committees (the University of South Australia, Royal Adelaide Hospital and Southern Adelaide

56   Clinical Human Research Ethics Committee).

57   **Protocol**

58   Eligibility criteria were verified from medical records. Interviews were conducted on the hospital

59   ward, within a month of their stroke. First, three open ended questions were posed to understand

60   how people with stroke view PA:

61   1.   Over the past month, did you do anything to maintain or increase your PA?

62   2. How do you view the link between stroke and PA?

63   3. What would you define as PA?

64   The interviewer prompted with specific examples if required. These questions have previously

65   been used to explore attitudes towards PA in people with hypertension[12].

66   The second part of the interview involved completing the Barriers to Physical Activity in

67   Disability Survey (B-PADS)[13]. The B-PADS comprises 34 items, the majority being yes/no

68   questions. This tool has been validated in people following stroke living in the community and

69   has high reproducibility (Cohen's κ 0.76) and inter-rater reliability ($\kappa = 0.86$)[13].

70   The interview times ranged from 8-25 minutes. All interviews were digitally recorded and

71   transcribed verbatim.

72   **Data Analysis**

73   Data were summarised with appropriate descriptive statistics (mean and standard deviation (SD)

74   for continuous variables, count and frequency for categorical variables). For the primary

75   outcome, PA habits and awareness of PA as a risk factor for stroke, transcripts were examined and

76   analysed using summative content analysis[14] to identify related concepts and determine frequency

77   of these concepts within participants' responses. Two investigators (MMcD and RSW)

78   independently generated initial codes from interview transcripts, before focusing and grouping

79   the codes into concepts. Concepts were refined and named, and transcripts reviewed again to

80   verify against coded data extracts. The frequency of these concepts within the sample of

81   responses was calculated and reported as a percentage of the total number of terms coded for

82   each question. To address the secondary aim, barriers to participating in PA in this population pre-

83   stroke, frequency of responses to the B-PADS were summarised. Associations between variables

84 were explored with generalized linear models using STATA® software (Version 10) and p < 0.05

85 was considered statistically significant.

86 RESULTS

87 Demographic data for the 81 adults recruited are provided in Table 1.

88 *Physical activity prior to stroke*

89 Participants, who were within a month of their first-ever stroke (n = 81), were asked about their

90 PA levels in the month prior to their stroke. There were a variety of responses, often involving

91 more than one category, and 81% of participants reported that they did some form of PA in the

92 month prior to their stroke. The common responses, and associated categories, are shown in Table

93 2.

94 The majority of participants reported that the only regular PA they did in the month prior to the

95 stroke consisted of instrumental activities of daily living (IADL), as mentioned by Participant

96 #66:

97 "*Shopping and putting away of groceries. Usually an hour, not every day, two times a week*".

98 Almost half of the participants reported they did some form of walking each day, and some even

99 counted their steps:

100 *"Walking, things like that. I don't get up and go for a ten km walk. I just walk a lot. 9000 steps, and most*

101 *days I reached that".* Participant #40.

102 Only 25 of the 81 participants reported regular exercise in the month prior to their stroke, with

103 swimming, golf, attending the gym and running given as examples.

104 Of those 19 participants who did not undertake any regular PA in the month prior to their stroke,

105 many gave examples of falls, pain or other conditions which limited their activity.

106   *"I was a slug. Because I have been having trouble with my back. I haven't been able to do anything*
107   *very much at all".* Participant #69.

108   *The link between stroke and PA*

109   The responses to the question "How do you view the link between stroke and PA" were assigned

110   a dominant response per participant. This revealed a striking lack of awareness of physical

111   inactivity as a strong risk factor for stroke. Two participants suggested that too much PA in the

112   days leading up actually caused their stroke. The majority of respondents (41%) had never

113   considered the possibility that the two factors were linked and frequently used the term "no idea"

114   (Figure 1) and is illustrated by this quote:

115   *No, I don't know I'm not the doctor!"* Participant #7.

116   Many participants felt that PA was unrelated to stroke, and gave examples of stress, diet or family

117   history as the cause for their stroke.

118   *"I don't think there is a link between stroke and physical activity, I don't know about diet but smoking*
119   *seems to be a bad one for me!"* Participant #4.

120   *"I think it could, I had it in my family. My mum passed away with a stroke".* Participant #50.

121   *Definition of PA*

122   Finally, in response to the question "What would you define as physical activity?" there was a lot

123   of overlap between categories, as shown in Table 3. Again, PA was defined using examples of

124   IADLs such as gardening, shopping and housework (47 participants) or walking (57 participants).

125   One in four participants reflected upon what they had done recently, for example:

126   *"In general, everything that I do. I do my back garden, take my walker and do my walking"* Participant

127   #13.

128   A number of participants required prompting to answer this question, and this often led to

129   mentioning sport as the definition of PA:

130   *"Exercise and going to gym and things like that. Playing sports".* Participant #34.

131   *Barriers to Physical Activity Survey*

132   The B-PADS survey was used to collect information on the types of barriers that participants may

133   perceive related to exercise participation. The majority of participants had exercised regularly in

134   the past (58 participants, 72%) although many reported that they had stopped regular exercise

135   decades ago. Few participants had been advised to exercise by their regular doctor (n = 20, 25%)

136   and of those who were advised to exercise, only half were told to do anything specific. Despite

137   this, 80% of participants (n = 65) felt that an exercise program could help them, and 77% of

138   participants (n = 62) were aware of a fitness centre that they could get to. However, 31% of

139   participants (n = 25) reported that health problems have caused them to stop exercising, and a

140   similar proportion (32%, n = 26) had been injured from exercising in the past.

141   The barriers to PA reported by participants were most frequently intrinsic personal factors, as

142   shown in Table 3.

143   *Relationship between variables*

144   To explore the effect of participant characteristics on the likelihood of being regularly active,

145   participants were grouped into those who did regular exercise (regular walking or other exercise

146   such as golf, of going to the gym, 46%) and those who did not exercise regularly in the past

147   month (54%). There was a significant inverse relationship between age and likelihood of being

148   active, with a 30% increase in physical inactivity with each decade of advanced age ($p = 0.01$,

149   Incidence Rate Ratio 1.30). There was no association between walking aid use (no aid vs walking

150   stick/frame/wheelchair prior to stroke) and being active ($p = 0.29$) or between awareness of

151   physical inactivity as a risk factor for stroke and likelihood of being active in the month prior to

152   stroke ($p = 0.43$).

153   DISCUSSION

154   The primary outcome of this study, understanding PA preferences and association of PA with

155   stroke risk, revealed that in the month prior to their stroke, participants were much more likely to

156   be involved in IADL and walking than sports and other formal modes of exercise. The majority

157   of participants had never considered the relationship between PA and stroke, and only one third

158   were aware that inactivity was in fact a risk factor for stroke. Few participants were advised to

159   exercise by their local doctor, despite two-thirds of the participants having hypertension and

160   almost half suffering from at least one cardiac complaint.

161   This study highlights the steps that need to be taken to increase the awareness of physical

162   inactivity as a powerful stroke risk factor, and to raise awareness of the impact that healthy

163   lifestyle choices can have on reducing their risk of stroke. One quarter of participants had a

164   fatalistic attitude to their own stroke, reporting that it was inevitable due to family history or

165   because they were unlucky: "*I think it's a roll of the dice*" Participant #37.

166   When asked what physical activity they had done in the month prior to their stroke, 81% of

167   participants responded that they were physically active. However, when questioned further it was

168 clear that only 30% were involved in regular moderately intense exercise. In this sample of older

169 adults, many defined PA as walking but their only regular PA were IADLs such as housework and

170 gardening.

171 The B-PADs survey revealed that environmental barriers were not a concern for the majority of

172 people prior to stroke. Most participants knew of a local fitness centre, and transport was not an

173 issue. This contrasts markedly from the results of Rimmer et al[13] where community-dwelling

174 stroke survivors reported environmental/facility barriers much more frequently. However,

175 considering our participants were reflecting back to their activity levels prior to stroke our

176 findings are similar to the work of Moschny et al[11] with healthy older adults who report poor

177 health (58%), lack of company (43%) and lack of interest (37%) as the most frequent barriers to

178 PA.

179 The overwhelming majority of participants responded that intrinsic personal factors limited their

180 desire to take part in exercise, most commonly lack of interest, motivation and energy. Some

181 participants expressed a strong dislike of exercise, although they considered themselves to be

182 physically active. The challenge in these individuals is to engage them in activities that they are

183 interested in, focusing on the social aspects and the possibility that physical activity can be

184 enjoyable for physical health and mental well-being[11], and move away from structured regimes

185 involving limited exercise options. This is particularly important given the 30% decrease in PA

186 for each decade of advanced age: finding physical activities that are safe and interesting for older

187 adults to participate in may help prevent the age-related decline in PA.

188 Although many participants did suffer from cardiac conditions and other co-morbidities such as

189 asthma, diabetes and arthritis, less than a third of participants reported that health concerns

190 prevented them from exercising. This may in part be due to the poor awareness of the role of

191 physical activity in managing and improve conditions such as diabetes and cardiovascular

192   disease. The challenge for primary prevention is to encourage people to take up regular exercise,

193   particularly if they do present with other stroke risk factors in the hope that early intervention can

194   prevent later stroke and profound disability. Even those who have not participated in exercise

195   recently can be reassured that in the event of a stroke, higher PA levels in the month prior to

196   stroke are associated with better short-term functional outcomes after stroke[15].

197   A limitation of this study was that we did not quantify the amount or intensity of physical activity

198   that was performed in the month prior to the stroke. This could have been done to ascertain

199   whether participants met the recommended Physical Activity guidelines[16], or quantified their PA

200   in terms of metabolic units per week using the International Physical Activity Questionnaire[17].

201   This was not completed partly because of the likelihood of recall bias but also to avoid any

202   distress that may be caused by such questioning so close to their stroke event. Future studies

203   should address this, because of the known link between moderately vigorous physical activity

204   and reduced risk of stroke[18]. However, a strength of this study was the relatively large sample size

205   for a qualitative study, allowing insights into physical activity habits which may not have been

206   captured with standardised surveys.

207   CONCLUSIONS

208   Adults who have recently suffered a stroke report little motivation to undertake exercise, and

209   little awareness of the risk of stroke from low levels of physical activity. They define physical

210   activity using low intensity activities like shopping and walking, and these are the most common

211   forms of PA that they undertake. The challenge for future health care policy is to increase

212   awareness of PA as a modifiable risk factor for stroke, and engage older adults in suitable ways to

213   increase their PA, particularly moderately intense activity in accordance with PA guidelines.

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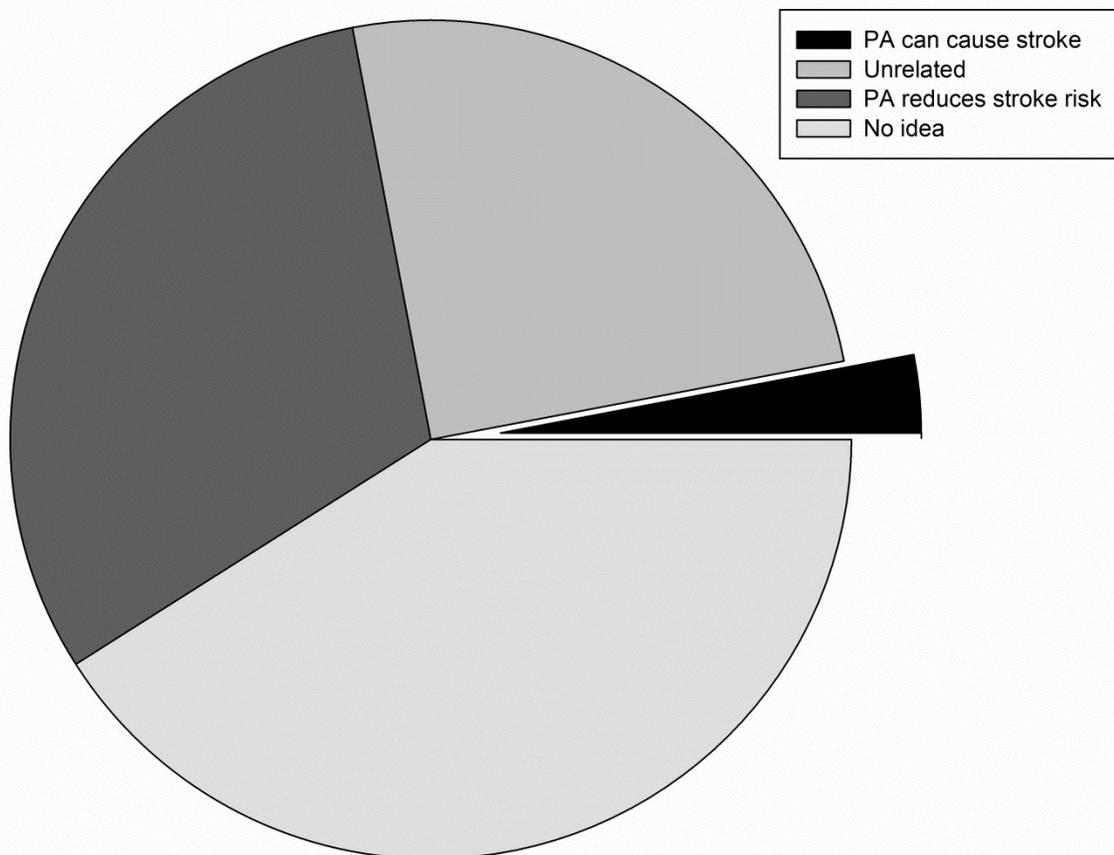
270 **Figure 1 title: Responses to the question "How do you view the link between stroke and PA".**

271 **Figure 1: Proportion of responses to the question "How do you view the link between stroke and PA" coded**

272 **as: PA can cause a stroke (3%), they are unrelated (25%), PA reduces stroke risk (31%) or no awareness**

273 **stroke of a link (no idea) (41%).**

How do you view the link between stroke and physical activity?

Legend:
- ■ PA can cause stroke
- ▨ Unrelated
- ▨ PA reduces stroke risk
- ▫ No idea

274 **Table 1. Demographic characteristics of participants**

	n = 81
Sex	54M, 27F
Age (mean, SD)	67.6 ± 13.2
Days since stroke (median, range)	6 (1-30)
Stroke type, infarct (n, %)	56 (69%)
Stroke location, cortical stroke (n, %)	44 (54%)
Stroke risk factors (n, %)	
Hypertension	53 (65%)
Diabetes	16 (20%)
Current smoker	21 (26%)
Hypercholesterolaemia	28 (35%)
Previous TIA	7 (9%)
Cardiac complications*, ≥ 1	34 (42%)
Number of other comorbidities† (median, range)	3.8 (1-10)

275 *Cardiac complications included, but were not limited to, ischaemic heart disease, myocardial infarct, coronary artery bypass
276 grafts, heart failure, permanent pacemaker, atrial fibrillation, cardiomyopathy, congestive cardiac failure
277 †Other comorbidities included, but were not limited to, depression, emphysema, rheumatoid arthritis, joint replacements,
278 hypothyroidism, obesity, diabetes, renal failure, anaemia, chronic obstructive pulmonary disease.

279 **Table 2. Physical activity levels in the month prior to stroke.**

Question: Over the past month, did you do anything to maintain or increase your physical activity?		Number of codes identified and % of responses compared to total number of responses
Yes (81% participants)	Walking	43, 30%
	IADLs e.g. shopping, work	54, 38%
	Regular exercise e.g. gym, running, swimming	25, 18%
No (19% participants)	Unable to (too hot, recently unwell) or don't need/want to	19, 14%

 Table 3. Definition of PA

Question: "What would you define as physical activity?"	Number of codes identified and % of responses compared to total number of responses
1. Walking for exercise	57, 26%
2. IADL related	47, 22%
3. When prompted for examples then sport mostly	51, 23%
4. Egocentric, what **they** had done in past months to years	26, 12%
5. Physiological definition	37, 17%

281 **Table 4. Self-reported barriers to physical activity prior to a first-ever stroke, according to**

282 **the Barriers to Physical Activity and Disability Survey**

Barrier	% of participants (n = 81)
Personal	
Lack of motivation	58
Lack of interest	50
Lack of energy	42
Exercise is boring or monotonous	42
Lack of time	40
Pain prevents me from exercising	31
Health concerns prevent me from exercising	29
Environmental/Facility	
Cost of the program	36
Lack of transportation	26
Not aware of fitness centre in the area	23
Don't feel trainer in facility is able to help	18