Additional Table 4. Behavioural analysis of Active Brains using the Behaviour Change Wheel (BCW) and Theoretical Domains Framework (TDF)

Target Behaviour	Barrier/ *facilitator* to target behaviour	Evidence for barrier/ facilitator/ intervention ingredient	Intervention ingredient	Target construct (BCW)	Key TDF domains relevant	Intervention function (BCW)	BCT (using 93 BCTs on BCT taxonomy v1)
	Key behaviour: Initial engagement with Active Brains starter session						
Registering on Active Brains study website	Low health literacy Low digital literacy Busy Too little time Forgetting to do it Privacy and credibility concerns *Access to home computer* *Skills in using computer* *Desire to maintain healthy cognitive function* *Time to engage* *Perceived utility of online technology* *Interest in study*	Ware, Bartlett (1) – qual. study of older adults' preferences, interests and concerns re. use of e-health technologies Adams, Stubbs (2) – psychological barriers to internet use Bozoki, Radovanovic (3) – lack of access a barrier O'Connor, Hanlon (4) – factors affecting patient/public engagement with digital health interventions PPI provided various suggestions about wording clarification on recruitment materials	Targeting user group who may have more time to engage (retired older adults) Persuasive information leaflet highlighting benefits of study Information leaflet and website written in clear simple language to ensure readability (iterated with PPI and users)	Psychological capability Physical opportunity Reflective motivation	Knowledge Environmental context and resources Beliefs about capabilities, beliefs about consequences, intentions	Education Persuasion Enablement	1.2 Problem Solving 5.1 Information about health consequences 9.1 Credible source
Logging onto Active Brains	Low health literacy Low digital literacy Busy Too little time	Ware, Bartlett (1) – qual. study of older adults' preferences, interests and concerns	Simple login procedures with instructions (iterated with PPI and users)	Physical capability	Skills	Education Enablement Environmental restructuring	3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour

starter section	Forgetting to do it *Access to home computer* *Skills in using computer* *Desire to maintain healthy cognitive function* *Time to engage* *Prompts/reminders* *Perceived utility of online technology* *Interest in study*	re. use of e-health technologies Adams, Stubbs (2) – psychological barriers to internet use Bozoki, Radovanovic (3) – lack of access a barrier	Easily navigable website (iterated with PPI and users) Automated reminders if user has not logged in after registration Behavioural facilitation (support arm)	Psychological capability Automatic motivation Physical opportunity Social opportunity	Knowledge, memory, attention and decision making processes Reinforcement Environmental context and resources Social influences	Persuasion	7.1 Prompts/cues 15.1 Verbal persuasion about capability
Selecting physical activity, reducing sedentary time, strength and balance, brain training, or healthy eating session in Active Brains website	Lack of interest in/recognition of importance of behaviour Negative attitudes towards/perceptions of behaviour Behaviour not considered important/relevant *Positive outcome expectancy* *Interest in/enjoyment of target behaviour* *Novelty of activities* *Perceived benefits*	van Uffelen, Heesch (5) -people don't accurately recognise/report sedentary time Chong, Doyle (6), Cox, Flicker (7) – enjoyment of activities important Yardley, Morrison (8) – user preferences for information provision PPI feedback suggested some clarifications needed to navigation of 'menu' pages	Introductory section presents rationale for study and different components Staggered release of modules to allow gradual engagement with content and periodic 'new' content Users presented with choice of sessions, with guided advice tailored to mobility Motivational emails highlighting benefits of target behaviours Behavioural facilitation (support arm)	Psychological capability Physical opportunity Social opportunity	Knowledge Environmental context and resources Social influences	Education Enablement Environmental restructuring Modelling Persuasion	3.1 Social support (unspecified) 5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 7.1 Prompts/cues 9.1 Credible source 15.1 Verbal persuasion about capability

	Key behaviour: Increased physical activity						
Setting goals to increase physical activity	Process too complicated Suggested goals/activities not considered relevant Low self-efficacy for activities *Perceived credibility/trustworthiness/ persuasiveness* *Ease of process* *Desire to challenge self* *Desire to improve fitness* *Activities seem achievable/realistic* *Self-efficacy for activities* *Perceived benefits*	Gray, Hunt (9) – simplicity of activities appreciated Erickson, Voss (10) Harris, Kerry (11) Marcus, Forsyth (12) Orbell and Sheeran (13) Nyman, Adamczewska (14)- evidence of effectiveness of specific physical activities or activity programmes or techniques for initiating new behaviours (e.g. goal setting) Aalbers, Baars (15), Müller and Khoo (16), Peels, van Stralen (17) – tailoring for different levels of capability important Price, Corwin (18) - evidence-based, credible communication of link between increasing physical activity and cognitive health	Content focused on building motivation and capability to engage in physical activity through: - explanation of key benefits backed up by evidence; - suggestion of simple, graded activities, tailored to mobility/current physical activity level – walking recommended as primary activity; - examples of others and their experiences; - structured guidance on simple goal setting and action planning; - addressing concerns that users may have Pedometers available for individuals to self-monitor and set goals related to step count Motivational emails highlighting benefits of physical activity and reminding users that they can set/revise goals at any time	Psychological capability Reflective motivation Physical opportunity Social opportunity	Behavioural regulation Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences Environmental context and resources Social influences	Education Enablement Environmental restructuring Modelling Persuasion	1.1 Goal setting (behaviour) 1.2 Problem Solving 1.4 Action Planning 3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 4.2 Information about antecedents 5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 7.1 Prompts/cues 8.2 Behaviour substitution 8.3 Habit formation 8.4 Habit reversal 8.7 Graded tasks 9.1 Credible source 11.3 Conserving mental resources 12.2 Restructuring the social environment 12.5 Adding objects to the environment 15.1 Verbal persuasion about capability

Engaging in increased physical activity	Poor health status/ physical functional ability, e.g. frailty, pain, memory problems Low self-efficacy Poor outcome expectations Inactive lifestyle habits Unsuitable environment – safety (fear of falling); availability and accessibility of facilities e.g. parks Inflexible routine Weather Doubts about capabilities Doubts about necessity of PA Negative attitudes towards PA Lack of social support Low motivation *Perceived benefits and value of PA* *Fun/Enjoyment* *Sense of control over one's physical activity behaviour* *Social support and maintenance of social bonds* *Prompts/reminders* *Physician advice* *Flexible routine* *Activities perceived as realistic*	**Determinants** Chong, Doyle (6), Forberger, Bammann (19), Greaney, Lees (20), Baert, Gorus (21), Warner, Wolff (22), Rhodes, Martin (23), Direito, Walsh (24), Martin and Sinden (25), Van Dyck, Cardon (26), Smith, Banting (27), Clarke, Sniehotta (28), Manz, Mensink (29), Notthoff, Reisch (30), Devereux-Fitzgerald, Powell (31), Schutzer and Graves (32), Normansell, Smith (33) **Intervention ingredients** Tang, Smith (34) – information about social, emotional and environmental consequences (BCTs) associated with larger effect sizes for change in self-efficacy for PA Notthoff, Klomp (35) – older adults show greater motivation and better recognition of messages in PA interventions when messages are positively framed	(Also as above) Printable plans available from website, to position somewhere memorable at home Motivational emails sent to remind users to engage in activities at user-selected time-points 'Reasons to stay active' card – with examples from others Users encouraged to discuss concerns/ fears/ perceived barriers with friends/ family members and to explain the activities they are participating in so as to allow the individual to provide encouragement and reassurance Behavioural facilitation (support arm) - contact with facilitator will provide praise, encouragement, reassurance and will seek to help the participant solve any issues faced	Automatic motivation Reflective motivation Social opportunity	Reinforcement, emotion Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences Social influences	Education Environmental restructuring Persuasion	3.1 Social support (unspecified) 3.3 Social support emotional 4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 7.1 Prompts/cues 8.1 Behavioural practice/rehearsal 8.3 Habit formation 8.7 Graded tasks 13.1 Identification of self as role model 15.1 Verbal persuasion about capability 16.3 Vicarious consequences

		Nyman, Adamczewska (14), Peels, van Stralen (17), Peels, van Stralen (36), Lara, O'Brien (37), Peels, de Vries (38), Peels, Bolman (39) - potentially important components of interventions for increasing PA: self-monitoring; social aspects/support; suggestions for local physical activity options; promotion of autonomy and provision of positive reinforcement for small achievements; tailoring for participants with different limitations; optional exercises; simple goal setting					
Key behaviour: Reduced sedentary behaviour							
Making plans to take breaks from sitting	Process too complicated Suggested plans not considered relevant/realistic Low self-efficacy for making changes *Perceived credibility/trustworthiness/ persuasiveness* *Ease of process*	Gardner, Smith (40) – education and persuasion important components of promising interventions to reduce sedentary time Marcus, Forsyth (12), Orbell and Sheeran (13) – evidence for efficacy of goal setting/	Website content focused on building motivation and capability to take breaks from sitting through: - explanation of key benefits backed up by evidence; - suggestion of simple activities, tailored to mobility/current physical activity level;	Psychological capability Reflective motivation	Behavioural regulation Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences	Education Enablement Environmental restructuring Modelling Persuasion	1.1 Goal setting (behaviour) 1.2 Problem Solving 1.4 Action Planning 1.9 Commitment 3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 4.2 Information about antecedents

	Desire to challenge self *Desire to improve fitness* *Changes seem achievable/realistic* *Self-efficacy for making changes* *Perceived benefits*	implementation intentions in increasing PA Aalbers, Baars (15), Müller and Khoo (16), Peels, van Stralen (17) – tailoring for different levels of capability important Price, Corwin (18) - evidence-based, credible communication of link between increasing physical activity and cognitive health	- examples of others and their experiences; - structured guidance on goal setting and planning actions at specific times/in specific contexts; - addressing concerns that users may have Motivational emails highlighting benefits of taking breaks from sitting and reminding users that they can set/revise goals at any time	Physical opportunity Social opportunity	Environmental context and resources Social influences		5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 7.1 Prompts/cues 8.2 Behaviour substitution 8.3 Habit formation 8.7 Graded tasks 9.1 Credible source 11.3 Conserving mental resources 15.1 Verbal persuasion about capability
Modifying physical environment to encourage breaks from sitting	Lack of knowledge about how to implement Considered too much effort to implement changes Suggested changes not considered relevant/realistic *Perceived credibility/trustworthiness/ persuasiveness* *Ease of making changes* *Changes seem achievable/realistic* *Perceived benefits*	Gardner, Smith (40) – environmental restructuring (physical and social) an important component of promising interventions to reduce sedentary time PPI feedback on early material question realistic nature of some of the action planning suggestions	As part of goal setting, users are given information about the value of modifying the physical environment to encourage behaviour change and ideas as to how to do it Action planning offers suggestions of simple and quick ways to do this that users can choose from when setting goals	Reflective motivation Physical opportunity	Goals, intentions, beliefs about consequences Environmental context and resources	Education Environmental restructuring Modelling Persuasion	1.4 Action Planning 4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 7.1 Prompts/cues 8.2 Behaviour substitution 8.3 Habit formation 12.1 Restructuring the physical environment 12.2 Restructuring the social environment
Taking breaks from sitting	Pain/stiffness, Low self-efficacy	Chastin, Fitzpatrick (41), Chastin, Buck (42), Owen, Sugiyama (43),	(Also as per 'making plans' above)	Automatic motivation	Reinforcement	Education Environmental restructuring	3.1 Social support (unspecified)

	Functional limitations Ageist stereotypes/perceptions Attractiveness/ enjoyment of sedentary activities Low control over behaviour (e.g. at work) Retirement status Perceived safety of neighbourhood Availability of places to rest *Pain/stiffness* *Self-efficacy* *Desire to relieve boredom* *Perception of tasks to do* *Family and social commitments and Motivation,* *Good weather,* *Desire to show independence* *Improved mood from movement*	Brug and Chinapaw (44) - determinants of sedentary behaviour Gardner, Smith (40)– review of sedentary behaviour intervention components Van Dyck, Cardon (26) - psychological, social and physical environmental characteristics predicting changes in physical activity and sedentary behaviours	Printable plans available from website, to position somewhere memorable at home Motivational emails sent to remind users to engage in activities at user-selected time-points Behavioural facilitation (support arm) -contact with facilitator will provide praise, encouragement, reassurance and will seek to help the participant solve any issues faced	Reflective motivation Social opportunity	Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences Social influences	Persuasion	4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 7.1 Prompts/cues 8.1 Behavioural practice/rehearsal 8.3 Habit formation 8.7 Graded tasks 13.1 Identification of self as role model 13.2 Framing/reframing 15.1 Verbal persuasion about capability
	Key behaviour: Uptake of strength and balance exercises						
Setting goals/ action plans to do exercises	Process too complicated Suggested exercises not considered relevant/realistic Low self-efficacy for exercises Perceived lack of time to do exercises Concerns about whether exercises are safe	Fiatarone Singh, Gates (45) – evidence for effectiveness of strength training in protecting cognitive health Clemson, Fiatarone Singh (46), Clemson, Munro (47) – evidence for effectiveness of S & B programme with	Website content focused on building motivation and capability to engage in strength and balance exercises through: - encouraging that simple exercises are built into daily activities - explanation of key benefits backed up by evidence;	Psychological capability Reflective motivation Physical opportunity	Behavioural regulation Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences	Education Enablement Environmental restructuring Modelling Persuasion	1.1 Goal setting (behaviour) 1.2 Problem Solving 1.4 Action Planning 1.9 Commitment 3.1 Social support (unspecified) 3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 4.2 Information about antecedents

	Perceived credibility/trustworthiness/ persuasiveness *Ease of process* *Desire to improve strength and balance* *Exercises seem achievable/realistic* *Self-efficacy for exercises* *Perceived benefits*	exercises built into daily activities Marcus, Forsyth (12), Orbell and Sheeran (13) – evidence for efficacy of goal setting/ implementation intentions in increasing PA Aalbers, Baars (15), Müller and Khoo (16), Peels, van Stralen (17) – tailoring for different levels of capability important Price, Corwin (18) - evidence-based, credible communication of link between increasing physical activity and cognitive health	- suggestion of simple activities, tailored to mobility/current physical activity level; - examples of others and their experiences; - structured guidance on goal setting/ action planning; - addressing concerns that users may have		Environmental context and resources		5.1 Information about health consequences 5.6 Information about emotional consequences 6.1 Demonstration of the behaviour 7.1 Prompts/cues 8.2 Behaviour substitution 8.3 Habit formation 8.7 Graded tasks 9.1 Credible source 11.3 Conserving mental resources 12.1 Restructuring the physical environment 12.5 Adding objects to the environment 13.2 Framing/reframing
Doing strength and balance exercises	Poor health status/ physical functional ability, e.g. frailty, pain, memory problems Low self-efficacy for exercises Poor outcome expectations Safety concerns (fear of falling) Doubts about necessity of exercises Lack of social support Low motivation	Share many of the same determinants as general increase in PA behaviour, e.g.: Chong, Doyle (6), Forberger, Bammann (19), Greaney, Lees (20), Baert, Gorus (21), Warner, Wolff (22), Rhodes, Martin (23), Direito, Walsh (24), Martin and Sinden (25), Van Dyck, Cardon (26),	(Also, as above) Audio-visual demonstration of the exercises to refer back to Printable plans available from website, to position somewhere memorable at home Motivational emails highlighting benefits of strength and balance	Physical capability Automatic motivation Reflective motivation	Physical skills Reinforcement Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences	Education Environmental restructuring Persuasion Training	3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 6.1 Demonstration of the behaviour 7.1 Prompts/cues 8.1 Behavioural practice/rehearsal 8.3 Habit formation 8.7 Graded tasks

	Perceived benefits and value of strength and balance *Fun/Enjoyment* *Sense of control over one's physical capability* *Social support* *Prompts/reminders* *Physician advice* *Exercises perceived as realistic*	Smith, Banting (27), Clarke, Sniehotta (28), Manz, Mensink (29), Notthoff, Reisch (30), Devereux-Fitzgerald, Powell (31), Schutzer and Graves (32), Normansell, Smith (33)	exercise and reminding users that they can set/revise goals at any time Users encouraged to discuss concerns/ fears/ perceived barriers with friends/ family members and to explain the activities they are participating in so as to allow the individual to provide encouragement and reassurance Behavioural facilitation (support arm) -contact with facilitator will provide praise, encouragement, reassurance and will seek to help the participant solve any issues faced	Social opportunity	Social influences		12.5 Adding objects to the environment 15.1 Verbal persuasion about capability
	Key behaviour: Uptake of brain training						
Making a plan to brain train regularly	Process too complicated Brain Training games not considered relevant Low self-efficacy for brain training games *Perceived credibility/trustworthiness/ persuasiveness* *Ease of process* *Desire to challenge self* *Desire to keep brain active* *Self-efficacy for BT games* *Perceived benefits*	Bozoki, Radovanovic (3) – willingness to challenge self impacts on engagement with online cognitive training Haesner, Steinert (48) – perceived utility/ outcome expectations important for engagement with online cognitive training	Website content focused on building motivation and capability to engage in brain training through: - explanation of key benefits backed up by evidence; - examples of others and their experiences; - structured guidance on planning/goal setting; - addressing concerns that users may have	Psychological capability Reflective motivation Physical opportunity	Behavioural regulation Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences Environmental context and resources	Education Enablement Environmental restructuring Modelling Persuasion	1.1 Goal setting (behaviour) 1.2 Problem Solving 1.4 Action Planning 3.1 Social support (unspecified) 3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 4.2 Information about antecedents 5.1 Information about health consequences 7.1 Prompts/cues

			Motivational emails highlighting benefits of brain training	Social opportunity	Social influences		8.3 Habit formation 8.7 Graded tasks 9.1 Credible source 13.2 Framing/reframing
Initial access to, and playing, brain training games	Low perceived capability/self-efficacy Difficult to access/use *Positive outcome expectancy* *Previous experience* *Enjoyment/interest in activities* *Credibility/trustworthiness*	Gates, Sachdev (49), Corbett, Owen (50), Kueider, Parisi (51), Willis, Tennstedt (52) - evidence that online cognitive training effective Kueider, Parisi (51) – most older adults didn't need to be tech savvy to benefit from online cognitive training McDougall Jr (53), Pike, Chong (54), Mohan (55) – self-efficacy and perceptions of ability to use and complete tasks important	(Also, as above) Printable plans available from website, to position somewhere memorable at home Motivational emails sent to remind users to engage in brain training at regular intervals	Physical capability Reflective motivation Physical opportunity	Skills Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences Environmental context and resources	Education Environmental restructuring Persuasion Training	4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 7.1 Prompts/cues 8.1 Behavioural practice/rehearsal 8.3 Habit formation 8.7 Graded tasks
Regularly logging back in to complete brain training games	Forgetting Boredom/loss of interest Low perceived capability/self-efficacy Perception of poor previous performance Difficult to access/use *Positive outcome expectancy* *Previous experience* *Enjoyment/interest in activities* *Credibility/trustworthiness*	Haesner, O'Sullivan (56) – interest/enjoyment of activities important McDougall Jr (53), Pike, Chong (54), Mohan (55) – self-efficacy and perceptions of ability to use and complete tasks important Corbett, Owen (50) – loss of engagement high	Motivational emails highlighting benefits of brain training New games released over time to keep users stimulated and interested in brain training Users encouraged to discuss concerns/ fears/ perceived barriers with friends/ family members and to explain the activities they are	Psychological capability Reflective motivation	Memory, attention and decision processes Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences	Education Environmental restructuring Persuasion	3.1 Social support (unspecified) 3.3 Social support (emotional) 5.1 Information about health consequences 7.1 Prompts/cues 8.1 Behavioural practice/rehearsal 8.3 Habit formation 8.7 Graded tasks 15.1 Verbal persuasion about capability

	Sense of challenge/ competition with self	PPI reported need for more clarity about how long games are likely to take	participating in so as to allow the individual to provide encouragement and reassurance Behavioural facilitation (support arm) - contact with facilitator will provide praise, encouragement, reassurance and will seek to help the participant solve any issues faced	Automatic motivation Social opportunity	Reinforcement, emotion Social influence		
	Key behaviour: Uptake of Mediterranean diet (plus nuts)						
Setting goals to eat more healthily	Process too complicated Negative attitudes towards/perceptions of healthy eating Healthy eating not considered important/relevant Low self-efficacy for making dietary changes *Perceived credibility/trustworthiness/ persuasiveness* *Ease of process* *Positive outcome expectancy* *Perceived benefits – e.g. health, weight loss* *Social support* *Self-efficacy*	Valls-Pedret, Sala-Vila (57) – evidence for med diet as protective of cognitive health Gray, Hunt (9) – simplicity of advice about lifestyle behaviour change appreciated	Website content focused on building motivation and capability to eat more healthily through: - simple messages about small changes to make for healthier food choices - explanation of key benefits backed up by evidence; - examples of others and their experiences; - structured guidance on goal setting; - addressing concerns that users may have Motivational emails highlighting benefits of healthy eating	Psychological capability Reflective motivation Physical opportunity Social opportunity	Behavioural regulation Goals, beliefs about capabilities, optimism, intentions, beliefs about consequences Environmental context and resources Social influences	Education Enablement Environmental restructuring Modelling Persuasion	1.1 Goal setting (behaviour) 1.2 Problem Solving 1.4 Action Planning 1.9 Commitment 3.1 Social support (unspecified) 3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 4.2 Information about antecedents 5.1 Information about health consequences 7.1 Prompts/cues 8.3 Habit formation 8.7 Graded tasks 9.1 Credible source 12.2 Restructuring the social environment

Engaging in healthier eating	Cost Availability of cheap junk food Eating out/ socially Pleasure (esp. alcohol) Dislike of healthy food options Competing priorities/time Unplanned shopping Entrenched food beliefs/ behaviours Identity Lack of capability/ knowledge *Clear simple advice, advice around swapping foods* *Experience of ill-health/ health concerns* *Short-term benefits* *Weight loss,* *Identity* *Friends/family support,* *Perceived capability to make dietary changes*	Petroka, Campbell-Bussiere (58), Seguin, Connor (59), Kelly, Martin (60), Nicklett and Kadell (61), Lo, Chang (62), Payette and Shatenstein (63), Bloom, Edwards (64), Bloom, Lawrence (65), Robinson (66), Appleton, Dinnella (67), Sahyoun, Zhang (68), Greene, Lofgren (69) – various determinants of healthy eating behaviour (especially amongst older adults) Gray, Hunt (9) – simplicity of advice appreciated	(Also, as above) Printable plans available from website, to position somewhere memorable at home Motivational emails sent to remind users to engage in activities at user-selected time-points Users encouraged to discuss concerns/ fears/ perceived barriers with friends/ family members and to explain the activities they are participating in so as to allow the individual to provide encouragement and reassurance Behavioural facilitation (support arm) - contact with facilitator will provide praise, encouragement, reassurance and will seek to help the participant solve any issues faced	Automatic motivation Reflective motivation Physical opportunity Social opportunity	Reinforcement, emotion Goals, beliefs about capabilities, optimism, intentions, beliefs about consequence Environmental context and resources Social influences	Education Environmental restructuring Persuasion	3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 7.1 Prompts/cues 8.1 Behavioural practice/rehearsal 8.3 Habit formation 8.7 Graded tasks 15.1 Verbal persuasion about capability
	Key behaviour: Reviewing behaviour and revising goals for all behaviours						
Reviewing behaviour and revising goals	Boredom Perceived poor performance Competing priorities Forgetting *Perceived good performance*	Lara, O'Brien (37) - Self-monitoring as important ingredient O'Brien, McDonald (70) – feedback appears promising for long-term	Simple, easy to access goal review facility providing tailored feedback Motivational emails reminding users to review and revise goals	Psychological capability	Memory, attention and decision processes, behavioural regulation	Education Environmental restructuring Modelling Persuasion	1.1 Goal setting (behaviour) 1.2 Problem Solving 1.4 Action Planning 1.5 Review behaviour goals 1.9 Commitment 2.2 Feedback on behaviour

	Prompts/reminders *Keen to monitor progress*	engagement with PA behaviours Gardner, Smith (40)– review of sedentary behaviour intervention components – self-monitoring important	Goal review website page offering tailored positive feedback on behaviour, links to other activities to try and stories of other users' experiences Behavioural facilitation (support arm)	Automatic motivation Reflective motivation Physical opportunity Social opportunity	Reinforcement, emotion Goals, intentions, beliefs about consequence Environmental context and resources Social influences		2.3 Self-monitoring of behaviour 3.1 Social support (unspecified) 4.2 Information about antecedents 5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 6.2 Social comparison 7.1 Prompts/cues 8.2 Behaviour substitution 8.3 Habit formation 8.7 Graded tasks 10.4 Social reward 11.3 Conserving mental resources 12.1Restructuring the physical environment 12.2 Restructuring the social environment 12.5 Adding objects to the environment 15.1 Verbal persuasion about capability 15.3 Focus on past success
	Key behaviour: Integration of Active Brains activities into daily routines						
Integrating chosen behaviours into daily life *(reducing*	Forgetting Lack of time/ competing priorities Negative experience of trying new activities Low perceived quality of the intervention Environmental cues	Stiggelbout, Hopman-Rock (71)– predicting maintenance of exercise in older adults Brooker, Wesnes (72) – evidence about day to day activities with	Motivational emails to prompt continued engagement with activities and present new ideas outside of website will focus on:	Psychological capability	Memory, attention and decision processes, behavioural regulation	Education Environmental restructuring Modelling Persuasion	1.1 Problem Solving 1.5 Review behaviour goals 3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 4.2 Information about antecedents

reliance on Active Brains starter session)	*Social support* *Simplicity of behaviours* *Fit of behaviours with daily life* *Enjoyment of activities* *Experience of benefit from participation* *Enjoyment/ positive [perceptions of intervention*	benefits for cognitive function	- reinforcing key messages about benefits, - suggest new activities or ideas, - prompt continued engagement and behavioural rehearsal/substitution Additional content at 7 months will offer: - online and offline resources links that might interest users - access to all previous content - ideas about day-to-day activities that can also help keep the brain active Behavioural facilitation (support arm)	Automatic motivation Reflective motivation Physical opportunity Social opportunity	Reinforcement, emotion Intentions, beliefs about consequences Environmental context and resources Social influences		5.1 Information about health consequences 5.3 Information about social and environmental consequences 5.6 Information about emotional consequences 7.1 Prompts/cues 8.1 Behavioural practice/rehearsal 8.2 Behaviour substitution 8.3 Habit formation 8.6 Generalisation of target behaviour 8.7 Graded tasks 10.4 Social reward 12.1 Restructuring the physical environment 12.2 Restructuring the social environment 15.1 Verbal persuasion about capability 15.3 Focus on past success
Key behaviour: Maintained engagement with Active Brains intervention							
Logging into Active Brains study website	Forgetting Lack of time Feeling discouraged/ frustrated/ bored of intervention *Ease of use* *Enjoyment of website/intervention* *Looking for specific information/advice*	O'Connor, Hanlon (4) – factors affecting patient/public engagement with digital health interventions Yardley, Morrison (8) – user preferences for information provision	Motivational emails to remind users to log into website and give reasons for engagement Access to new brain training games/ new sections of website contingent on regular access to website	Automatic motivation Physical opportunity	Reinforcement, emotion Environmental context and resources	Education Environmental restructuring Persuasion Incentivisation	3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 7.1 Prompts/cues 9.1 Credible source 10.1 Material incentive (behaviour) 10.2 Material incentive (reward)

			After 7 months recommendations about a 'maintenance' brain training schedule				
Completing intervention measures	Forgetting Lack of time Length of measures Complexity of tasks *Altruism* *Perception of benefit* *Ease of participation*	Rolstad, Adler (73), Iglesias and Torgerson (74) – evidence about influences on completion of questionnaires PPI reported early draft of follow-up measures being too extensive and time-consuming – decision made to split into small 'essential' and larger 'secondary' measures	Intervention measures limited to only essential measures, clearly explained and introduced to users, suitable for target user group Broken into sections to allow completion of 'essential' and secondary measures separately Motivational emails to remind users to log into website and give reasons for engagement	Psychological capability Automatic motivation Physical opportunity	Memory, attention and decision processes Reinforcement, emotion Environmental context and resources	Education Enablement Environmental restructuring Persuasion	3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 7.1 Prompts/cues 9.1 Credible source

N.B. The table provides key examples of evidence about behavioural determinants and intended intervention functions but is not an exhaustive record

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