‘We need people who look strong in a variety of ways:’ Using the Physical Activity Messaging Framework to Co-Design Strength Training Messaging

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Abstract

Physical activity guidelines and their supplementary messaging play an essential role in raising awareness and changing behaviour at a population level. However, recent research suggests a low awareness of, and adherence to, strength training guidelines, especially when compared to the aerobic guidelines. This study applied the Physical Activity Messaging Framework (PAMF) with an aim of co-designing strength training messaging guidance. Twenty adults (n=18 females, n=2 males) aged 40-60 years residing in the Greater Manchester area of the United Kingdom participated in one, four-hour, in-person workshop at the University of Salford. Participants were in the contemplation, preparation, action, maintenance, or relapse stage of health behaviour change. The focus group activities and resulting discussions aligned with the PAMF to identify message content, format, and delivery that would resonate with the target audience. Interestingly, discussions revealed that people in this age demographic knew ‘*why* you should do it’ (participate in strength training). However, guidelines or messaging campaigns telling people ‘*what* do to*’* (*‘build strength at least twice per week’*) were not sufficiently detailed to change behaviour. Participants proposed that future messaging campaigns include a quick response (QR) code linking to more detailed information on ‘*how* to do it,’ practically and effectively. This is the first study to use the PAMF to create strength training messaging guidance and recommendations for future mass media campaigns.

Keywords: resistance; exercise; guidelines; communication; marketing; adults

Introduction

Physical activity guidelines are the fundamental way we bring the latest scientific research to the public and should be used to form the basis of raising awareness and improving participation [1]. Physical activity guidelines have historically emphasised aerobic exercise for the improvement of physical health [1]. More recently, guidelines have attempted to bring resistance exercise to the foreground, especially for the strength and function of muscles, bones, and joints [2, 3]. Despite decades of significant research interest, increasing physical activity levels remains a challenge. Often referred to as the 'forgotten' guideline, the strength component is of particular concern. Research suggests there is low awareness of strength guidelines, even in aerobically active older adults and exercise instructors [4-6]. Thus, we continue to see a lack of participation in strength-based exercise when compared to aerobic-based exercise [7, 8].

Physical activity guidelines alone are not enough and need to be supplemented with messaging strategies [9]. Increasing the effectiveness of our science and health communication through scalable, mass media messaging is an important investment for a number of reasons [10]. Resistance training participation among people already meeting the aerobic guidelines results in an even lower risk of developing sarcopenia-related symptoms [11]. Resistance training is also one of the only ways to slow the decline in physical function, and reduce the risk of falls, fractures, and frailty. On the other hand, for those who are not yet meeting the aerobic guidelines, participating in resistance training has been shown to spontaneously increase physical activity levels [12].

There continues to be many barriers facing resistance training uptake and adherence, especially when compared to aerobic training. Notably, the barriers include the (real and/or perceived) need for specialised equipment, facilities, and knowledge [13, 14]. Furthermore, strength training as an exercise modality and the (inter)national guidelines promoting strength-based exercise do not seem to resonate well with public; strength training is still believed only to be relevant for those looking to achieve a 'muscular' appearance or improve sports performance [4, 15]. Finally, guidance is seen as vague, offering little information on 'how' to (practically) get started with strength-based exercise [4, 5].

If we want to reach the targets set out in the WHO Global Action Plan of Physical Activity, communication and messaging strategies that address (real and/or perceived) resistance training barriers will need to be supported [1, 16, 17]. The World Health Organization (WHO) and the International Society for Physical Activity and Health (ISPAH) both recommend the use of mass media campaigns with clear, consistent messages to encourage higher levels of awareness and participation [18]. While there are several campaigns in the United Kingdom (UK) targeting physical activity in general (in girls, This Girl Can [19], and in people living with long-term conditions, We Are Undefeatable [20], and Stronger My Way [21]), there are no national level campaigns that specifically address strength training upstream, that is, for adults without long-term health conditions. Targeting this demographic represents a key opportunity to build strength and robust strength training habits as one enters later life [22].

Therefore, we aimed to co-design guidance for future strength-based messaging targeting adults aged 40-60 years old. This study used the Physical Activity Messaging Framework and Checklist (PAMF/C), a consensus statement and user guide from an international expert panel on how to aid the creation and evaluation of physical activity messages [23]. Using the PAMF/C as a tool, we co-designed guidance, that when implemented, might more effectively influence proximal, intermediate, and distal outcomes such as strength training awareness, motivation, intention, and behaviour [24].

Methods

Twenty participants were recruited following their participation in an earlier online mixed-methods survey conducted in December 2023 (onlinesurveys.co.uk). Inclusion criteria included: self-identified as 40-60 years old and residing in the geographical region of Greater Manchester, England, United Kingdom. Participants were invited to participate in a one-time, four-hour, in-person workshop that took place in a board room at the University of Salford, Greater Manchester, in January 2024 (see Table 1 for self-reported participant demographics).

Focus Groups - Behavioural Segmentation

The Transtheoretical Model of health behaviour change consists of six stages of change: precontemplation (people not intending to take action towards behaviour change and tend to avoid reading, talking, or thinking about their behaviour), contemplation (intending to change in the next six months), preparation (intending to take action in the immediate future), action (have made some specific changes to behaviour), maintenance (continued action toward behaviour change and working to prevent relapse), and termination (no temptation to relapse and complete self-efficacy). Relapse, although not a separate stage of the model, is characterised as a return to an earlier stage of the model [25]. For this study, we excluded those who self-identified to be in the precontemplation stage of change, as health promotion programmes (like mass media messaging) are not expected to be sufficient to change behaviour [25].

Based off their self-identified stage of change, participants were assigned to one of four focus groups (n=5) in order to explore shared social meanings and perspectives around 'ideal' strength training messaging. Table 1 contained participants who had not participated in strength training previously (that is, participants were in the contemplation and preparation stages of change). Table 2 contained participants who had participated in strength training (irregular action and relapse stages). Table 3 contained participants currently participating in a once-per-week strength training programme (underdosed action stage). Finally, table 4 contained participants who were consistently participating in strength training at least twice-per-week (the recommended frequency) for over a year (maintenance stage) [25].

Physical activity messaging framework (PAMF)

Following assigned seating, focus group activities closely aligned with the Physical Activity Messaging Framework and Checklist (PAMF/C), a consensus reached by international experts, led by Williamson et al (2021) (see Table 3). Decisions that were pre-

specified (see blue headings in Table 3) included 'I am using this checklist to create a new message,' 'target population identified,' 'target audience engaged with to inform message development,' 'time of year,' 'specific aim of the message.' All other categories of the PAMF/C (see green headings in Table 3) display the result of discussions amongst the 20 public participants.

Table 1. Self-reported participant demographics (n=20)

Category	Subgroup	n=
Sex	Female	18
	Male	2
Age	40 - 49	10
	50 - 59	8
	60+	2
Ethnicity	British	17
	Irish	1
	Asian	1
	Caribbean	1
Education	Master's	7
	Bachelor's	11
	High school	2
Employment	Full time	13
	Part time	5
	Stay at home	1
	Retired	1
Transtheoretical Model Stage of Change	Precontemplation	0
	Contemplation	3
	Preparation	2
	Action[a]	8
	Maintenance	6
	Relapse	1

[a]Action stage included participants who reportedly participated in strength training, but participation was reported to be irregular, infrequent, underdosed (once per week), or twice per week for less than one year.

Ethics

This study was reviewed and approved by the University of Salford's Research Ethics Board (2023-0073-41). Participants were sent the information sheet and consent form via email and informed written consent was obtained prior to the in-person workshop.

Analysis

Qualitative data from focus group activities and discussions were transcribed by each table using the paper and pens provided. Utilising the PAMF/C and its pre-determined categories as semantic themes, data was coded and analysed in a 'top-down' or deductive,

thematic manner and reported in a descriptive way, appropriate for public consumption (see Table 3) [26-28].

Specifically, in addition to the author facilitating the workshop and its contained focus groups, and thus being immersed in the day's discussions, she submerged herself in the written data from each table, reading and re-reading all transcripts in the weeks following the workshop. Coding was systematic and thorough, moving forwards and backwards through familiarisation and coding, identifying patterns across the dataset [26-28]. Phases 3-5 in the thematic analysis method (theme development, refinement, and naming) were pre-determined by the PAMF/C categories set forth by Williamson et al. (2020) [23].

Reflexivity

The author is a University (Research) Fellow and Clinical Exercise Physiologist, with a bias towards strength training promotion, participation, and evidence-based implementation. She has academic and clinical knowledge and experience in interviewing and focus groups with the public around strength training awareness and (barriers to) participation. Thematic analysis was produced and reported through this lens.

Results

The workshop began and ended with a strength training association activity. Prior to any discussion, participants were asked '*what is the first thing you think of when I say strength training?*' Participants wrote their answer on paper, anonymously (except for indicating their table number), and then placed it in an envelope marked 'before.' Participants were asked the same question at the end of the four-hour session. This time, they were also asked to put either '(same)' or '(different)' on their responses to indicate whether their thoughts and associations had stayed the same or had changed. Again, responses were anonymous (except for their table number) in an attempt to discourage social-desirability bias. As such, 'before' and 'after' responses cannot be matched to each other and are separated below only per table.

Table 2. 'Strength training' association results

Table	**Before** workshop commences	**After** workshop concludes
1	Weights	Functional fitness (different)
	Lifting weights	Necessary (different)
	Squats	Improved health (different)
	Body building	Less dementia (different)
	Support for ageing	Squats/weights exercises to help strength for health (different)
2	Weight training	Resistance training (different)
	Compound barbell exercises	Important (different)
	Hard work	Varied (different)

	Boring Something I enjoy and am actively wanting to return to doing regularly	Longevity (different) Something that needs to become the norm (different)
3	Weights Exercising Power Pain Getting shredded	Essential (different) Achievement (different) Fitness (different) Health (different) Progression (different)
4	Weights Lifting weights Resistance loading Instagram World's strongest man	For everyone (different) Good health (different) Health (different) Resistance (same), Feel good factor (different) World's strongest man (same)

The subsequent activities and resulting discussions are presented in Table 3, as they are in direct alignment to the guidance presented in the PAMC [23].

Table 3. Results aligned to the Physical Activity Messaging Checklist (PAMC) [23]

	Results
I am using this checklist to create a new message	Yes; a new strength-based physical activity message
Who? (in which groups?)	Pre-specified decisions
Target population identified	Males and Females, 40-60 years old, living in the Greater Manchester region, United Kingdom.
Target audience engaged with to inform message development	Yes; 20 participants were involved and informed this messaging guidance via in-person focus groups. Males (n=2) and Females (n=18), 40-60 years old (40-60+), living in the Greater Manchester region, United Kingdom.
When? (in which context?)	Pre-specified decisions
Time of year and social/political context of message considered	Workshop took place January 2024, potentially capitalising on new year motivation.
What? (is the aim?)	Pre-specified decisions
Specific aim of message identified and specific outcomes relating to the aim identified and clearly stated	Aim of the message is to -improve motivation to participate in strength training -improve knowledge on *how* to do strength training and Outcomes of interest include

	-influencing current messengers/campaigns to include strength-based exercise in their physical activity messages and -produce poster prototype (with the ability to be disseminated in the future – both printed and online)
How? (is it to work?)	Pre-specified decisions
Potential pathway(s) by which message may bring about change in the outcome(s) of interest identified (e.g., targeting beliefs about capabilities)	Providing co-produced evidence directly to current messengers/campaigns on what targeted cohort finds relevant and motivating with regards to strength-based messaging. Directly increasing attention and awareness, and attempting to influence motivation and behaviour by -repeated exposure to upward social comparison via social modelling/norms and -visual reminders alongside nudges/cue to action (via links to practical knowledge on 'how' to practically participate in strength training)
Why?	Pre-specified decisions
Decisions based on co-production with the target audience	Yes; decisions based on co-production with the target audience in January 2024 (one-time, four-hour, in-person workshop)
Decisions based on existing literature and evidence involving the target audience	Yes; decisions to complete this piece of research was based on existing literature suggesting a lack of awareness and participation in strength training [4]
Type of information	Results via in-person focus group discussions
Message contains "what to do" information (quantity and type of activity). For example: "Aim for 10,000 steps a day!"	The Chief Medical Officers' physical activity guideline infographic includes frequency guidance, which was seen as helpful. However, participants required additional information in order to act (that is, beyond frequency, this infographic was seen as '*too vague'*). The American College of Sports Medicine (ACSM) Resistance Training for Health infographic (listing reps, sets, tempo, intensity, etc) was seen as clear and sufficiently detailed to overcome knowledge barrier [29]. The cohort thought there was enough information on this infographic to potentially be split into two infographics to further increase readability. Future guidelines and accompanying messaging/graphics could include more details directly or include a QR code linking to more detailed plans/programmes to further improve the 'what to do' message.

Message contains "why you should do it" information (e.g., physical, mental, social health, environmental benefits or appearance-based information). For example: "Take the stairs – feel less stressed!"	Although 'why' was not seen as the *most* important barrier to our cohort, they felt (in order of importance) (i) mental health (dementia), (ii) physical function, and (iii) physical health benefits were most relevant. Both short and long-term benefits were of interest to the cohort (that is, they wanted quick wins and were also motivated by longer-term factors such as delaying the onset or slowing the progression of age-related conditions) A deeply ingrained misconception was that strength training was *solely* for appearances (for those who wanted to look 'muscular') and sport performance.
Message contains "how to do it" information (practical or supportive information). For example: "Did you know that we run a group walk for older adults every Thursday at 12pm?"	'How' to practically *do* strength training was a resounding theme of the focus groups and workshop. Participants wanted exercise examples and demonstrations, tips on when and how to progress their training, access to both online and in-person provisions, as well as ample signposting to all these options. Progressive overload (an important strength training principle) was of surprise to most everyone, even those who were already participating in the recommended frequency of strength training. Some regular participants admitted to doing '*one set of the same exercises for over a year'* or simply '*going through the motions*.' Relating to the lack of knowledge and use of progressive overload, participants noted that only the very basic movements and programming variables were currently available on their 'go-to' websites for health and wellness information (trusted, national level websites; for example, www.nhs.uk) Future messaging guidance and provision need to be more ability-inclusive by including options for beginner, intermediate, and advanced/robust abilities and participants.
Framing, targeting	Results via in-person focus group discussions
Message content is gain-framed	Yes; strength training messaging should emphasise the benefits of participation
Message content is loss-framed	No; loss-framed messages were not used or preferred

Message content is generic (suitable for all)	Somewhat; participants particularly liked the generic message, 'strength training is recommended and beneficial for all ages and abilities.'
Message content is tailored to an *individual*	No; Not feasible in mass media messaging
Message content is *targeted* at a group	Yes; targeted to an age (40-60 years) and geographical (Greater Manchester) demographic. Content is also targeted to adults between the contemplation and termination stage of change in the transtheoretical model of behavioural segmentation. As such, this (targeted but not tailored) messaging will likely *not* directly influence those in the precontemplation stage.
Message content is *personalised*	No; not feasible in mass media messaging
Use of language	Results via in-person focus group discussions
Appropriate language and choice of words considered (e.g., ethnically, culturally, contextually and age-appropriate)	Preference for 'risk reduction' over 'prevention of disease' for some participants (Table 1); 'prevention' seen as victim blaming. 'Everyone has their own starting point' and 'benefits of participation outweigh the risks' were both seen as inclusive messaging. Terms 'elderly' and 'older adults' were inappropriate.
Message conveyed using a particular tone	Tone should be age-positive ('getting better' as you get older), inclusive, and encouraging (individually and culturally; that is, encouraging a 'culture' of movement)
Message content	Results via in-person focus group discussions
Message uses text to convey information (e.g., "physical activity is fun")	Great use of text included -personal success stories in the form of quotations -detailed information on programming (reps, sets, intensity, progression)
Message uses images or videos to convey information (e.g., images or footage of people having fun being physically active)	Photographs/images of a variety of real, age-appropriate people (and even of older (>60 years old) than targeted demographic) with different body types were all seen to be most inspiring. Images of those who were younger than targeted cohort (<40 years old) did not seem to have the same inspiring effect.

	Participants wanted to see sweaty people, being active and strong in a variety of settings (home, park/outdoors, work/office, gym/exercise class). Cartoons of people were not preferred (stick/blob icons were the least preferred).
Message uses music	Music did not appear to be important or helpful.

Message format	Results via in-person focus group discussions
Radio advert	Briefly mentioned, not preferred format
TV advert	Briefly mentioned, not preferred format (if used, display during the evenings and weekends)
Poster	Predominately poster based, with QR code to link to further information (especially, *how* to practically *do* strength training)
Leaflet or pamphlet	Not mentioned; clear preference for electronic options (app-based)
Social media post	Platforms discussed include Instagram and Facebook Little mention of TikTok, Snapchat, Twitter Participants use social media in the evenings
Email	Briefly mentioned; possibly as nudges, every 6 months
SMS/text message	Not mentioned
Other	Workplace computer screens were seen as an important yet missed opportunity to display messages
The message is of a specified length or volume	Mixed; both short and long-form content were appreciated and should be used in collaboration (short-form content that allows users to easily access more detailed information on demand)

Message delivery	Results via in-person focus group discussions
Health care professional (HCP, for example, General Practitioner)	Cohort recognised that their HCPs were not likely to give strength training guidance, however, messages on bulletin board and TV screens in waiting rooms were seen as an effective setting where people could read/learn more independently.
Family or friends	Intergenerational inspiration was key for those with (young) children.
Peers	**Preferred main source of message delivery.** Participants wanted to see success stories from peers, especially peers who have successfully managed to make strength training a weekly habit and have seen health/wellness benefits.
The media	Not mentioned

The Government	Not mentioned
Celebrities	Not mentioned; however, older (>60 years old) real-life people who are successfully participating in strength training and are featured or are trending on social media ('fitness influencers') were seen as inspiring and motivating.
Other	The employer/workplace seen as a major missed opportunity (that is, strength training messages, guidance, and provision should be delivered here). Participants wanted to see consistent messages (and branding) regardless of who delivers it.
The setting in which the message will be delivered has been considered and specified, e.g., at home, at school, at work, at the doctor's surgery, at bus stops etc.	The employer and the workplace seen as a *major* setting in which we should be delivering messages and provision (due to time spent in workplace, the importance of staying economically active in later life (a current issue in the UK), and strength training's perceived fit within existing health and wellbeing packages). Transport spaces (bus stops, advertisement inside trains) also mentioned as highly visible spaces. Gym was noted as especially relevant, as even though participants may be (aerobically) active, they needed more information in order to effectively participate and adhere to strength training.
The frequency, time of day and dose of message delivery have been considered and specified, e.g., 3 messages a week, set at 9am, for 3 months.	The time of day is specific -During work hours: messages on computer screens -To/from work: transport spaces -After work hours: social media -Weekends: gyms, grocery stores, and sport stadiums Participants wanted variety (several different images/success stories rotated throughout the settings of interest).

Lastly, in addition to the discussions specifically addressing the categories of the PAMC (as above, Table 3), we discussed a selection of current guidelines and campaigns.

The frequency provided (*'at least 2 days a week'*), on the UK's Chief Medical Officers' physical activity guidelines (CMO PAG) infographic was seen as unambiguous and helpful [2]. Otherwise, the infographic was seen as vague. The lack of intensity, time, and the examples provided did not help participants in their search for *how* to perform strength training. Yoga as a strength training example stirred confusion amongst the discussions.

The World Health Organization's physical activity guidelines (WHO PAG) included slightly better icons (outlines of real people) when compared to the CMO PAG (stick/blob people were not preferred) [3]. Participants felt the WHO PAG portrayed more inclusive examples of strength training (people using a park bench, for example). While participants appreciated more detail on intensity and guidance to '*involve all major muscle groups*,' participants were unsure how to judge *'moderate or greater intensity'* and what '*all major muscle groups'* actually were.

Participants felt that the American College of Sports Medicine (ACSM) Resistance Training for Health infographic was the most clear, informative, and therefore valuable visual [29]. Although '*wordy*,' participants thought that this infographic did tell them (almost) everything they needed to know to effectively perform strength training.

Participants appreciated that the campaign by the Chartered Society of Physiotherapy (CSP), 'stronger my way' used images of real, normal looking people at home [21]. There was a good use of stories and a QR code that linked to more. Participants presumed provision was evidence-based, as from professional body.

Participants felt that 'this girl can' was a well-known, (body) positive campaign, and enjoyed that it showed people working hard [19]. The current cohort (aged 40-60 years) found the perceived target age range of this campaign, and the use of the word 'girl' unrelatable. There was no perceived direction on 'what to do' or 'how to do it,' so participants were not sure what the call to action was. Importantly, as a female-based campaign, participants wanted to see (more) mention and information surrounding menopause.

The campaign 'we are undefeatable' targeting people with long-term conditions was not seen as inspiring as some of the other campaigns (even to the non-strength training table, some with self-reported health conditions) [20]. Participants felt that the people used in the campaign could have looked more active and happier. The '5 in 5' tagline (a 5-minute workout) was easy to remember. Participants noted that it was not (overtly) clear how trustworthy (evidence-based) the campaign was.

'Couch to fitness' a free web-based fitness programme, was seen to have a clever name (albeit 'fitness' was seen as a little vague) because of the positive association with the well-known 'couch to 5k' aerobic programme in the UK [30]. Participants appreciated the honest quote on their poster campaign ('I found the gym daunting') but perceived this programme to be targeting a younger age demographic due to their images. Participants would have liked to have seen a success story and more information about what type of 'fitness' this programme was targeting. The importance of easy and obvious linking to more information was stressed. Again, participants were not clear if this was an evidence-based programme.

Participants felt the CrossFit campaign rode a fine line between inspiring and age-positive and the perception of *'cultish'* or elitist [31]. Participants wanted CrossFit to make it clear that beginners would be welcome. CrossFit also could have more effectively

capitalised on the health and social benefits of participation. A greater diversity in their images would also be appreciated.

Discussion

Utilising the Physical Activity Messaging Framework and Checklist (PAMF/C) [23], we have co-designed guidance for messaging teams looking to improve strength training awareness and participation. Participants in this study were in the contemplation, preparation, action, maintenance, and relapse stages of behaviour change and were quite obviously interested in the topic. It was clear from discussions that '*how*' to perform strength-based exercise (practically and effectively) was the main barrier to uptake and regular, appropriately dosed participation. Thus, since '*why* should you do it' was understood, there was a strong preference for '*how* to do it' content. As a result, we would encourage future messaging to re-direct the focus from '*what* to do' and '*why* to do it' - giving '*how* to do it' precedence.

Mass media campaigns aimed to inspire (life-long, regular) strength training participation could be accompanied with QR codes. These QR codes could facilitate help-seeking behaviours by educating people on principles of strength training or signposting to qualified exercise professionals. Of note, participants resonated particularly well with the infographic from ACSM as it provided a clear and detailed training plan (*'perform 2-3 sets of 8-12 repetitions with good form, lift and lower the weight in a controlled manner…'*), which other guidelines and campaigns made less obvious or lacked altogether [29].

To the best of the author's knowledge, strength training has not been the focus of the PAMF, messaging research, or media campaigns to date. Stead et al (2019) in their comprehensive review of the public health messaging literature included 36 papers in their review of reviews and found seven of those included physical activity. The seven reviews targeted behaviours such as brisk walking, time spent walking, stair use, changes in physical activity, and self-reported activity [32]. Nevertheless, our findings are similar to a scoping review of 123 studies of general physical activity messaging [24]. Williamson et al. (2020) found that messages targeted towards adults should be framed positively, include short-term benefits of mental health, be delivered through peers, and use images [9, 24, 33]. There also has been support for the use of practical '*how* to' advice in general physical activity messaging [9, 33].

Our findings also parallel an online slogan experiment completed in Australia [34]. Pettigrew et al. (2023) tested different physical activity slogans in adults aged 50 years and older and found that in the youngest group (50-59 years), adults were most motivated by messages providing quantitative, evidence-based, and explicit guidance ('be active 30-60 minutes a day to stay fit and well') [34]. A preference for explicit guidance seems to mirror another report targeting Greater Manchester residents [35]. However, there does seem to be preference differences between adults and older adults. Adults in older groups (60-69, and 70+ years) seem to prefer more generic slogans without a quantitative threshold. Older demographics may also expect physical activity messaging to come from their health care providers [24]. When comparing males and females, no differences in slogan preferences

were detected in Australia, an interesting implication for the current study as it contained mostly female participants [34].

This study recruited from self-selecting participants to a previous online survey related to strength training. The cohort was predominately women, and all were from Greater Manchester, UK. Therefore, although we believe findings may translate to other geographical regions, caution should be used before findings are translated to a predominately male cohort. It is unlikely that these findings will effectively translate to other age demographics (people younger than 40 or greater than 60 years of age) or to people in the pre-contemplation stage of the Transtheoretical Model. Future research should look to co-design with these groups.

Strengths of this study include its co-designed focus with the targeted cohort, underpinned with the Physical Activity Messaging Framework (PAMF), allowing a thorough and deep understanding of preferences for 'ideal' strength training messaging. We found a consensus amongst the focus groups and thus, amongst people of various stages of behaviour change (contemplation through to relapse). The results of this study may provide a number of organisations with the evidence they need to implement a more relevant and salient strength training messaging strategy. The results may benefit anyone with the role of promoting or providing physical activity for health education or services including academics, clinicians, exercise professionals, the National Health Service, governments and local authorities, health and wellbeing centres, physical activity and/or ageing charities, as well as social media marketing teams.

Conclusions

Developing relevant, clear, and consistent strength training messaging may directly influence awareness, inform people on guideline targets, signpost to opportunities, provide inspiration and motivation, impact attitudes and social norms, and increase desirable health behaviours [36]. The findings from this qualitative co-design study have led to 11 guidelines for strength training messaging campaigns -

1. Use **images** of real people being active and strong in a variety of ways. Focus on diversity of body types, ethnicities, and ages. Avoid stick people or cartoon icons.
2. Quotes and **success stories** are an excellent use of text.
3. **Peers** are the preferred source of information and inspiration. Capitalise by asking more people to share their stories and experiences (see guideline 1 and 2).
4. It's not enough to tell people to do strength training (even when including frequency, muscle groups, or intensity). People need more details to know *how* to **practically** participate in strength training. People who don't know how or who don't feel confident they know enough, simply won't start.
5. People think strength training is only for appearance or performance. Including other **benefits** may be key to moving more people along to the next stage of behaviour change (from contemplation to preparation or from action to maintenance).

6. Both **short-term** benefits (like, blood glucose regulation) and **long-term** risk reduction (for instance, of dementia) are effective and should be used simultaneously.
7. People self-reporting to be participating in strength training are admittedly *'going through the motions'* or are quite inconsistent in their approach (as a direct result of not seeing any tangible benefits from their initial efforts). These people are further encouraged with information about the importance of **progressive overload** for continued benefits and lasting results.
8. Messages should be clear and **consistent** across messengers (to avoid confusion and frustration) but also need to be seen across several channels and settings. Employers and workplaces are believed to play a major role in promoting and encouraging strength-based exercise.
9. Effective messages are quickly and easily **linked** to more information and opportunities. QR codes should link to a mobile app or dedicated web page.
10. Inclusive messages include information and opportunities for **all abilities**, beginner to advanced.
11. Information coming from recognisable, **credible** sources are more effective (professional exercise bodies, relevant charities, and universities).

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