



Active older adults goal setting outcomes for engaging in a physical activity app and the motivation characteristics of these goals (MOVEAGE-ACT)

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ABSTRACT

Approximately 70% of older adults do not meet physical activity (PA) guidelines. While many interventions, are used in promoting PA, few target older adults or include substantial behavioural change techniques. Setting PA goals is often used but there is less research on goal setting outcomes, like improving health, preventing age effects, improving flexibility, goals that have been associated with increased likelihood of maintenance of PA. To understand the concept more fully in this cohort, the aim of this study was to identify older adults' goal setting outcomes - the purpose of engaging in a PA app and through analysis determine the motivation characteristics of these.

A cross-sectional, qualitative online survey was completed by 24, 60+, community dwelling, mostly active, French and Irish older adults. Thematic template analysis was used, and the motivation of these outcomes was assessed using the Self-Determination Theory of Motivation.

The themes were: improving/staying healthy or physically active, maintaining functional aspects of physical health, continuing to do the things I want, sustaining mental wellbeing, and preventing disease and aging. Individuals cited goal setting outcomes that were generic, specific or both, and goals related to maintenance of PA and prevention of aging decline, were cited most. The motivation characteristics of these goals in mostly active older adults were autonomous and internally driven.

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Interventions, including apps, for older adults that encourage them to set specific goal setting outcomes/purposes for PA, are likely to generate stronger internally driven motivation, enhance ownership and participation, and may therefore increase effectiveness.

1. Introduction

Engagement in regular physical activity (PA) has physical and mental health benefits for people of any age (Lee et al. 2012). In older adults, regular PA reduces the risk of many non-communicable diseases, falls, mental ill health, and cognitive decline (Cress et al. 2006; Reiner et al. 2013; WHO, 2020). The percentage of adults over 60 meeting the minimum 150 min moderate intensity PA guideline is very disparate, ranging from 2.4 % to 83 %, illustrating that is not optimal, at a time in life when it would be most effective and beneficial (Sun et al. 2013).

The inclusion of psychological behavioral change techniques in older adult PA interventions, including apps has been found to be effective (Chase, 2015; Cress et al. 2006). They include comparison of behavior (modelling of behavior against others), feedback and monitoring, social support, natural consequences (improved health), identity (identity of self as a role model) and goals and planning (Miche et al., 2013; Room et al. 2017). However, despite their effectiveness, there is still insufficient evidence to recommend the inclusion of specific behavioral change techniques in interventions (Huffman et al. 2021; Room et al. 2017).

Goal setting is a commonly used behavior change technique, used at different phases of behavior change from preparation to follow up and encompassing many different components, not all of which are included in all interventions (Lenzen et al. 2017). The most used component of goal setting is “goal setting behavior”. It involves establishing SMART goals (specific, measurable, achievable, and time-targeted) i.e., walking 150 min a week, and is effective in enhancing PA in older adults (Abraham & Michie, 2008; Hall et al. 2010; Lenzen et al. 2017). However there have been many calls to expand the behavior change components in interventions, including apps, so that more than one motivational “trick in the bag” is available to augment effectiveness (Baretta et al. 2019; Epton et al. 2017).

Another goal setting component is “goal setting outcomes” or as described by Room et al. (2017) the natural consequences of PA. These are defined as outcomes of a behavior e.g., having more flexibility, able to walk to the shops. Goal setting outcomes are not utilized or examined widely, more often used in inactive individuals, and seldom in the older adults (Abraham & Michie, 2008; Bearon et al. 2000; Davies et al. 2012; Freund et al. 2010; Howlett et al. 2019; Lenzen et al. 2017; Wichmann et al., 2020). The goal setting outcomes people select reflect their motivation, a key element in behavior change.

The Self-Determination Theory of Motivation is a framework commonly applied in PA studies to examine motivation (Friederichs et al. 2015), it distinguishes between intrinsic and extrinsic types of motivation (Deci & Ryan, 2000). Intrinsic motivation generally encompasses doing an activity because of the joy and satisfaction it gives (Deci & Ryan, 2000; Ryan & Deci, 2000). In contrast, extrinsic motivation refers to an outcome separate from the activity itself, for example living up to someone else’s standard (doctor or relative), or well internalized outcomes that are of personal importance for example, being able to continue walking (Deci & Ryan, 2000). Goal setting targets, such as 150 min are often imposed by external influences, including the health care team. While effective, especially in early engagement in PA programmes, they may deter long-term habit forming, as there is less personal ownership and motivation to adhere to these goals over time (Fortier et al. 2012). In contrast goal setting outcomes can be more intrinsically motivated and their identification and application may be more effective in achieving long-term engagement and maintenance in PA (Dacey et al. 2008; Huffman et al. 2021; Kwasnicka et al. 2016).

Due to the paucity of literature in this area, and the need to make PA interventions, including apps more effective in older adults, this study

sought to understand the concept more fully in this cohort by identifying older adults’ goal setting outcomes - the purpose of engaging in a PA app, and to examine the motivation characteristics of these goals.

2. Materials and methods

This study was part of a larger project, MOVEAGE-Act which sought approaches to enhance engagement in PA among older adults, including the exploration of behavioral change elements appropriate for PA apps for older adults, which is the aim of this study. The study has a qualitative descriptive design, using an online open survey to collect goal setting outcomes, which were then scrutinized utilizing the Self-Determination Theory of Motivation (Deci & Ryan 2000; Fortier et al. 2012). Ethics approval was received from The Faculty of Health Sciences Ethics Committee, Trinity College Dublin (Ref: 1811030).

2.1. Sample and recruitment

Recruitment utilized convenience sampling, through leaflet distribution at a conference on age-related themes, aging related public fairs and events in Ireland and France and via the website of two Non-Government Organizations for older adults in France and Ireland. Recruitment stopped after three weeks. The sampling was purposeful and homogeneous as the inclusion criteria were, community dwelling older adults ≥ 60 years, who did not have a long-term physical incapacity or pain that prohibited PA, or a neurocognitive disorder. e.g., memory problems, dementia, mild-cognitive impairment, delirium, major depression, bipolar disorder, schizophrenia. In addition, participants had to successfully complete the Physical Activity Readiness Questionnaire (PAR-Q) (Thomas et al. 1992).

The methodology was planned to ensure adequate “information power” within the qualitative data (Malterud et al. 2016). The strengths of the study were that the aim was narrow, the sample population was specific (older adults able to engage in PA), and the study used an established theory (Self-Determination Theory of Motivation) previously used in examining PA outcomes. The nature of the online data collection method meant that the discussion was limited but this was offset by the specificity of the question (Malterud et al. 2016). The information power was therefore sufficient as the 24 participants’ answers provided more than adequate data to achieve information redundancy/saturation to the point that the key themes were being repeated. No further recruitment of participants was therefore required.

2.2. Data collection

Written informed consent was obtained by ticking the online consent form. The study avoided prompting participants with predefined goals and categories, but instead presented them with an open question that they could answer spontaneously (Bearon et al. 2000). Thus, participants were asked “Why do you want to engage in this physical activity app” and were prompted to provide three responses. Data collection was anonymous, but to assist in putting the responses in context, the PA of the participants was also recorded. The short form version of the International Physical Activity Questionnaire (IPAQ) (Craig et al. 2003) was used to assess PA. The IPAQ is a validated, self-report questionnaire that assesses time spent in all PA domains – at home, work, transportation and leisure and all levels of PA – moderate PA, vigorous PA, and walking, over the preceding seven days.

2.3. Analysis

Descriptive statistics were used to describe PA. The output of the IPAQ was converted to metabolic equivalents (METs) so that total PA could be then converted to moderate PA minutes (Craig et al. 2003).

The replies to the core question were imported *verbatim* to an excel spreadsheet and manually manipulated and analyzed within this. The anonymous online nature of the data collection guaranteed that the researchers did not influence the participants’ responses. Braun & Clarke’s (2006), six phase approach to thematic content analysis was utilized. Due to the nature of the question being quite specific, the data corpus, all data collected, was utilized in the analysis (Braun & Clarke, 2006). While the elements in the data were not weighted, their frequency was numerated to indicate representativeness. An inductive approach to the themes was utilized, in that the themes were strongly linked to the data itself (Braun & Clarke, 2006). This approach has been recommended in areas where participants’ views on a topic are not well known (Patton, 1990).

The research team comprised 11 members. Three members with experience in qualitative research and research in PA in older adults, were tasked with the core analysis. They familiarized themselves with the data (Phase 1) and generated initial codes (Phase 2) and themes (Phases 3) independently. There were two further cycles of auditing, revising the analysis, re-examining, and refining the themes (Phases 4 and 5). In the final analysis phase, the resulting documentation was initially drafted by a member of the initial analysis team. To enhance methodological integrity, manage reflexivity and increase transparency, the themes and codes were reviewed and triangulated initially by the other two members of the three-member analysis team and then by the rest of the research team (Phase 6). Because all collected data was anonymous, member checking was not feasible.

3. Results

Forty-two participants initially signed up for the study, 11 did not proceed for unknown reasons and seven were excluded because they did not pass the eligibility criteria of readiness to partake in physical activity (PAR-Q). Although eligible to partake in unsupervised physical activity,

Table 1
Participant profile (n = 24 unless otherwise stated).

Gender (female) (n = 22)	55 % (12)
Physical activity (PA) ≥ 150 min of moderate physical activity per week	66 % (16)
Has your doctor ever said that you have a heart condition? Yes	13 % (3)
Has your doctor ever said that you have high blood pressure? Yes	17 % (4)
Do you lose balance because of dizziness OR have you lost consciousness in the last 12 months? Yes	4 % (1)
Have you ever been diagnosed with another chronic medical condition other than heart disease or high blood pressure? Yes	17 % (4)
Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? Yes	8 % (2)
Do you have arthritis, osteoporosis, or back problems? Yes	38 % (9)
Do you have joint problems causing pain, a recent fracture or fracture caused by osteoporosis or cancer, displaced vertebra (e.g., spondylolisthesis), and/or spondylolysis/pars defect (a crack in the bony ring on the back of the spinal column)? Yes	8 % (2)
Do you currently have cancer of any kind? Yes	8 % (2)
Do you have any metabolic conditions? This includes Type 1 Diabetes, Type 2 Diabetes, Pre-Diabetes. Yes	4 % (1)
Do you have any mental health problems or learning difficulties? This includes Alzheimer’s, dementia, depression, anxiety disorder, eating disorder, psychotic disorder, intellectual disability, down syndrome. Yes	8 % (2)
Do you have a respiratory disease? This includes chronic obstructive pulmonary disease, asthma, pulmonary high blood pressure. Yes	17 % (4)
Have you had a stroke? This includes transient ischemic attack (TIA) or cerebrovascular event. Yes	0 % (0)

38 % had a chronic disorder of some kind (see Table 1). A total of 66 % (n = 16) achieved the minimum guideline of 150 moderate intensity PA minutes per week. There was no obvious trend in gender or medical profile between those who met the guidelines and those that did not.

Twenty-four participants completed the study questionnaire, providing a total of 68 units of analysis. The analysis of the responses revealed six themes: improving or staying healthy, improving or staying physically active or fit, maintaining functional aspects of physical health, keeping my body in good physical health to be able to do the things I want to do, sustaining mental wellbeing and preventing disease and aging deterioration (Table 2). There were also cross cutting themes of maintenance/improvement and generic/specific goal setting outcomes (Table 1). An equal number of participants cited generic only, specific only and generic and specific goal setting outcomes. A smaller proportion of participants cited goal setting outcomes whose purpose could be classified as improvement (25 %), compared to maintenance (35 %) or both maintenance and improvement (45 %). The thematic descriptions below, will also include the appraisal of the data cited from a motivation point of view utilizing the Self-Determination Theory of Motivation (Deci & Ryan 2000; Fortier et al. 2012).

3.1. Theme 1: Improving or staying healthy

This theme reflects health as a general concept rather than specific aspects which are coded into other themes. Numerous participants (42 %) indicated that the purpose of engaging in a PA app was about health in general (Table 2).

While the majority of participants met PA guidelines, the participants were still motivated to engage in the PA app, possibly reflecting their recognition of the need for support in maintaining PA as a habit, a major challenge.

“Maintain health” (P11)

A smaller proportion of responses indicate the purpose in engaging in the app was to improve health:

“Improve my health” (P22)

Others referred more to the impact of being healthy:

“To live long with a good quality of life” (P3)

While some outcomes were mainly generic and probably of personal importance - stay healthy, improve health, others reflected an awareness and better synthesis of the impact of PA on good health and wellbeing long-term, thus increasing the likelihood of long-term engagement. Synthesis of the outcomes using the Self-Determination Theory of Motivation assessed that while motivation was extrinsic, the participants’ regulatory style was at the autonomous end of the motivation spectrum and was somewhat internal, most likely reflecting the generic focus of the outcomes (Table 3).

3.2. Theme 2: Improving or staying physically active or fit

Maintenance or improvement of PA or fitness was mainly generic and was cited by 38 % of the participants (Table 1):

“To maintain physical activity into old age” (P5)

Other expressed a desire to improve their PA or fitness in general:

“To increase my physical activity level” (P22)

This theme reflects somewhat internal, autonomous motivation with elements of an integrated regulation style related to maintenance and improvement of PA. (Table 3).

3.3. Theme 3: Functional aspects of physical health

Current older adult PA guidelines advocate doing two muscle

Table 2
Themes and categories derived from the exploration of older adults' goal setting outcomes for engaging in a physical activity intervention.

	Improve or stay healthy	Improve or stay physically active or fit	Functional aspects of physical health	Sustaining mental wellbeing	Prevent disease & ageing deterioration	Do the things I want to do
General maintenance	Remain in good health	Maintain fitness/ physical activity		Maintain mental health	Prevent disease and age related decline	
Specific maintenance	Live long with a good quality of life		Maintain tone/ strength/ balance/ flexibility	Maintain a positive attitude	Prevent dementia and osteoporosis	Continue doing the specific activities I like doing
General Improvement	Improve health	Increase physical activity / fitness		Feel better and more effective	Cope with and recover from disease	
Specific improvements			Improve tone/ balance/ flexibility sleep, weight control /energy levels	Reduce stress cognitive decline	Reduce the risk of falls and frailty	Get fit for trekking, skiing

Table 3
Classification of goal setting outcomes using the Self-Determination Theory, rows 1–4 indicating the framework and rows 5–6 indicating the classification of the goal setting outcomes within this framework (Adapted from Ryan & Deci, 2000).

Behaviour	Non-self-determined		Self-determined			
Motivation	Amotivation	Extrinsic motivation		Intrinsic motivation		
Regulatory styles	Non regulation	Controlled External regulation	Controlled Introjected regulation	Autonomous Identified regulation	Autonomous Integrated regulation	Autonomous Intrinsic regulation
Perceived locus of causality	Impersonal	External	Somewhat external	Somewhat internal	Internal	Inherent
Relevant regulatory processes (and theoretical examples)	Non-intentional, non-valuing, incompetence, lack of control	Compliance, external awards and avoid punishment	Self-control, ego involvement, internal awards and punishments, sense of obligation	Personal importance, conscious valuing, achieve personal goals	Congruence, awareness, synthesis with self	Interest, enjoyment, inherent satisfaction
Maintenance (project examples)	None	None		Keep healthy, Maintain physical activity Maintain mobilityPrevention of disease and decline (ageing)	Live long with a good quality of lifeNeed to keep going Maintain functional health (mobility) Maintain mental health (positive outlook) Prevention of disease and decline (dementia)	Continue activity (dancing) Feel good FunInterest
Improvement (Project examples)	None	None	Looking fitter	Improve healthImprove physical activity levels	Improve functional activity (e. g., flexibility)Improve mental health (stress)	Increase fitness for physical activity (trekking) Feel better

strengthening activities and three multicomponent physical activities at moderate intensity that emphasize strength and balance, per week (WHO 2020).

Most participants (71 %) cited a purpose that fell under the functional health umbrella (Table 1). In this category it was observed that responses emphasized improvement, more than maintenance:

“I want to improve my strength and balance” (P18)
“Improve flexibility” (P16)

Other responses alluded to specific characteristics of a healthy body that would be enabled by engaging in PA, such as energy, weight, sleep and mobility (Table 1).

“To maintain my mobility” (P19)
“Might sleep better” (P9)

In contrast to the goal setting outcomes in Themes 1 and 2, the outcomes in Theme 3 were much more specific. When the outcomes were assessed considering the Self-Determination Theory, the outcomes were autonomous, and the motivation was more internally focused, reflecting the personal importance of specific hoped-for direct and indirect impacts of PA (better sleep, mobility) and an awareness of specific functional health needs as they grow older (flexibility, strength, balance) (Table 3).

3.4. Theme 4: Sustaining mental health

In 1948, the WHO defined health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 2021). PA has long been used therapeutically to improve mental health (Tulloch et al. 2018). Many participants (38 %) were aware of this relationship, and cited mental health as being a reason why they were engaging in the PA app:

“Helps with reducing stress” (P16)

The outcomes here were both generic and specific, reflecting autonomous motivation, and awareness, in particular in relation to the indirect positive impact of PA in sustaining aspects of mental health (Table 3).

3.5. Theme 5: Prevention of disease and aging deterioration

This theme encompasses another component of the WHO 1948 definition of health, and arose directly from one of the participant's responses:

“to remain healthy as I get older” (P10)

This theme was cited by 42 % of participants, and awareness of the importance of PA in slowing down age-related decline was dominant

making up 63 % of these responses (Table 1).

“To keep age-related deterioration at bay” (P13)
 “— independence in later years” (P20)

As well as responses reflecting prevention of a generic nature, many participants referred to specific diseases that maintaining or improving PA might assist with:

“Recently diagnosed with osteoporosis” (P18)

The majority of outcomes focused on prevention, which was considered a maintenance focus rather than an improvement. Again, outcomes ranged from generic (prevent age-related illnesses) to specific (prevent dementia). The outcomes of this theme align with autonomous motivation, with the more generic outcomes more likely to be somewhat internally focused and of personal importance, while the more specific outcomes being more internally regulated through a process of greater awareness (Table 3).

3.6. Theme 6: To be able to do the things I want to do

This last theme emerged in 21 % of the participants and mainly reflected a desire to maintain or improve specific activities.

Sometimes the purpose of maintaining PA was focused on a specific aspect of their life

“To be an active part of my grandchildren’s lives” (P6)

Other participants cited that they wanted to maintain their fitness for specific activities:

“To be able to continue dancing as I age” (P10)

While others want to regain fitness for possibly a new activity or restarting and activity after an absence:

“To prepare for the water ski sessions” (P24)

The goal setting outcomes in this theme reflect even more specificity than earlier themes (Table 1). Motivation again fell at the autonomous end of the Self Determination scale, possibly reflecting both intrinsic and extrinsic motivation (Table 3). The outcomes participants cite ranged in their specificity from generic (e.g., to be an active part of my grandchildren’s lives) to specific (e.g., get fit for trekking). All outcomes in this theme were of personal importance to the participants, some are of personal interest and give them enjoyment and satisfaction which therefore reflect intrinsic, inherent motivation.

The codes, categories and subthemes discussed above, represented the vast bulk of the participants’ responses. Some isolated responses were left uncategorized and are worth mentioning. One response was simply “increase variety (P1)”. This is an important concept, particularly in relation to the long-term objective of making PA a habit. Another single word response was “fun” (P2), again an important concept essential to the maintenance of PA (Fortier et al. 2012) reflecting intrinsic motivation (Table 3).

4. Discussion

When enrolling in an app intervention to improve or maintain their PA, the goal setting outcomes of mostly active older adults cited related to improving/ maintaining overall health, functional aspects of physical health, mental wellbeing, preventing disease and aging and continuing to do the things I (they) want to do. Individuals were as likely to cite outcomes that were generic, specific or both, and participants cited more outcomes related to maintenance of PA except in health functionality where improvement was more common. The goal setting outcomes while mainly extrinsic were aligned with the self-determined end of the Self-Determination Theory continuum, exhibiting more internally driven, autonomous motivation reflecting personal importance.

The findings support the limited previous work in identifying PA

outcomes that are salient to participants (Bearon et al. 2000; Morgan et al. 2019). The most common outcomes cited by the older adults related to functional health outcomes (71 %) i.e., improved balance. In this study the outcomes originated from the individual themselves and are more health focused, in contrast to research examining extrinsic messaging where the process of exercise itself was most commonly cited (Freund et al. 2010). This study supports some previous findings that physical health-related outcomes were more common than mental health outcomes (Morgan et al. 2019), although other research ranked feeling mentally alert higher than physical health (Campbell et al. 2001). On an individual basis, while 33 % of individuals cited generic outcomes only, the remainder cited some aspect of specificity, like maintaining mobility. The increased specificity of outcomes aligns with the more intrinsically motivated end of the self-determination scale and likely to make the outcome more meaningful to them (Fortier et al. 2012; Morgan et al. 2019 Ryan & Deci, 2000). The autonomous, internal locus of motivation at the self-determined end of the Self-Determination Theory was expected, as the participants volunteered to partake in the study, they were not directed by anyone else (for example a doctor) to engage in the study (Patrick & Canevello, 2011; Ryan & Deci, 2000). Participants who did not meet the minimum guideline of 150 min of moderate physical activity per week had more generic purposes, where the motivations were classified as only somewhat internal (Table 3).

When examining the meaning and application of these findings, caution must be expressed as goal setting outcomes are only part of the motivation and adherence picture of engagement and maintenance in PA. In older adults, aspects such as process, interest, competence, and social connection also are important components of motivation in PA (Deci & Ryan 2000; Freund et al. 2010; Oppezzo et al. 2021; Patrick & Canevello, 2011). Future tailoring of PA interventions, including apps, may benefit from having more than one behavioral change “tool in the bag”, besides the current dominant emphasis on goal setting targets, i.e., 150 mins aerobic activity a week. Encouraging the setting of specific focused, person-centered, internalized, valued goal setting outcomes/ purposes of PA, through techniques like motivational interviewing, could be of great assistance and meaning to older adults, their family and support team in PA engagement and maintenance (Baretta et al. 2019; Bearon et al. 2000; Friederichs et al. 2015). These goals are more likely to be motivational, of personal importance and could increase the likelihood of long-term PA maintenance in the older adult through their having greater autonomy and ownership of the desired outcome(s) (Deci & Ryan, 2000, Huffman et al. 2021; Nelis et al. 2018).

This study examined a population that was relatively physically active and while this was a gap in the literature, usefully identifying the characteristics of the concept in this cohort, they are unlikely to be similar in older adults who are less physically active but rather characteristics that should be encouraged to be developed.

5. Conclusions

This study shows that the goal setting outcomes of older adults, who are mainly physically active, were important to them being able to live a healthy life, maintain their PA, to continue to function in day to day and leisure activities and prevent deterioration due to age and disease. Goal setting outcomes have meaning to older adults, indicate strong well internalized motivation, have personal value and importance to them. It is a challenge getting older adults to engage, maintain or improve PA, despite awareness of the documented benefits to this engagement. Adding additional behavioral change techniques such as goal setting outcomes in PA interventions for older adults, encouraging older adults to develop specific goal setting outcomes may increase the likelihood of success, through participants having greater ownership and purpose behind these goals, and thus generating stronger internal motivation.

CRediT authorship contribution statement

Aileen M. Lynch: Conceptualization, Methodology, Formal analysis, Funding acquisition, Writing – review & editing. **Sean Kilroy:** Methodology, Formal analysis, Writing – review & editing. **Heather McKee:** Conceptualization, Formal analysis, Writing – review & editing. **Fintan Sheerin:** Funding acquisition, Resources, Writing – review & editing. **Monique Epstein:** Resources, Writing – review & editing. **Ariane Girault:** Resources, Writing – review & editing, Project administration. **Pierre Gillois:** Resources, Writing – review & editing. **Jean Luc Bosson:** Resources, Writing – review & editing. **Carole Rolland:** Resources, Writing – review & editing, Project administration. **Mary Harkin:** Resources, Writing – review & editing, Project administration. **Ciarán McKinney:** Funding acquisition, Resources, Writing – review & editing. **Gabrielle McKee:** Conceptualization, Methodology, Formal analysis, Funding acquisition, Resources, Writing – original draft, Writing – review & editing, Visualization, Project administration.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

This is a qualitative study, data sharing is not usual practice,

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