

GUEST EDITORIAL

Maintaining long-term adherence to lifestyle interventions for cognitive health in late life

Long life expectancy is associated with a higher chance of experiencing cognitive impairment in a lifespan. It is well recognized that multiple factors play important roles in the maintenance of cognitive health when one gets older. While the mechanisms of neurodegeneration are complex, it is encouraging to note that simple healthy lifestyles maintained over time may modulate the rate of degeneration or buffer its effects when it becomes inevitable.

Accumulating evidence suggests that active pursuit of physical exercise and cognitive activities offer protective effects against cognitive decline and development of dementia (Valenzuela and Sachdev, 2009; Leung *et al.*, 2011; Sofi *et al.*, 2011). The protective effects appear to continue from early until late life (Richard and Deary, 2005). As a step toward translation of observations from epidemiologic data, large-scale clinical trials have been conducted, or are underway, to determine whether lifestyle intervention would benefit older adults at risk of developing cognitive disorders (Lautenschlager *et al.*, 2008; Gillette-Guyonnet *et al.*, 2009; Richard *et al.*, 2009). International collaborative efforts are playing pivotal role in offering advice and guidelines for successful intervention (Richard *et al.*, 2012). Issues related to modality, intensity, and outcome measures have attracted much attention. A relatively under-discussed topic, however, is adherence issues. To offer health benefits, interventions should be targeted toward long-term maintenance and a sustained personal lifestyle modification (Fappa *et al.*, 2008).

Barriers to practice

An active and continuous pursuit for a healthy state is an ideal that applies only to a minority of the conscientious health seekers. For most, an insight into the need for treatment of a disease condition to avoid discomfort and disabilities is probably the major driving force for compliance. Lifestyles are relatively enduring patterns of behaviors developed since early years and shaped by cultural and social background. Any change will require a breaking up of habitual routines and knowledge about health is often not translated into actions. Public education programs may raise consciousness

at the population level, but not necessarily lead to behavioral change (Cheng *et al.*, 2011). The beneficial effects of cognitive preservation may not be obvious enough to serve as a reinforcer for continuous practice. Intervention studies on lifestyle modification for cardiovascular health and chronic diseases suggested that factors such as peer support, age, health status, self-efficacy, cognitive and mental conditions were facilitators and barriers to intervention (Jackson *et al.*, 2009; Leijon *et al.*, 2011; Griffo *et al.*, 2012). It is also recognized that positive effects may cease after intervention stops, especially when supervised practice is no longer available (Lam *et al.*, 2010). These issues are equally important for brain health maintenance.

The cognitive reserve hypothesis relates lifestyle interventions in dementia prevention to cognitive and physical activities. Increasing research aims to explore the protective neural responses associated with cognitive and physical exercise intervention (Tucker and Stern, 2011; Steffener and Stern, 2012). It is likely that a level of intensity of practice has to be reached before neuronal activities are affected and cognitive benefits evident. At present, most brain health interventions are developed for older adults. Frailty and advanced age may limit activity level and affect practice involving great physical strength. Discovering the optimal intensity of physical activity for older adults with different health conditions would be an important agenda for future research. Even for healthy older adults, long-term adherence to exercise training may be affected by medical conditions that disrupt the practice. Interventions in midlife may bring greater beneficial effects, but an undetermined outcome that lies years ahead requires personal determination to succeed.

The mental and cognitive states of older adults also influence adherence. Although people with mild to moderate cognitive impairments do respond to physical and mental activity interventions (Lam *et al.*, 2012; Cheng *et al.*, in press), the motivation for participation may be affected by mood disturbances such as apathy and depression. It is, however, important to recognize that these non-cognitive symptoms also respond to interventions that encourage an active lifestyle (Williams and Tappen, 2008). Considerations have to be made to recruit participants who are reluctant to participate

due to mood disturbances. Another important concern is the ability for older adults to manage the new lifestyle routine. Close supervision to ensure adherence will be of primary significance in subjects with mild cognitive impairment and preclinical dementia, when executive function and memory impairments have already manifested. For home-based programs, regular outreach contacts from designated staff would be helpful in building up rapport and reduce dropouts. The involvement of family members would also be beneficial in facilitating adherence. Interventions carried out at social centers for older adults encourage social support and mutual sharing. Although this may have positive biases toward the more active participants, it may serve as an anchor point to attract the more passive and withdrawn people at risk of cognitive impairments. Staff at centers may also provide key roles in monitoring adherence to interventions and help to integrate lifestyle changes into long-term habits.

Optimizing adherence

Program designs are important determinants of successful lifestyle interventions. The content should be hypothesis driven, user friendly, and sufficiently appealing for integration into everyday leisure profile. Some cognitive training programs that utilize uninteresting stimuli may not be as effective as leisure activities that are pleasantly engaging. Considered as an intervention, there should also be clear rationale in the selection of modality and content that can be subject to hypothesis testing. The understanding of therapeutic elements will enable development of refined programs enriched with only essential components to optimize effect sizes. Program design may, however, make reference to the socio-economic background of participants, and should be culturally appropriate for ready acceptance by the majority. For example, the utilization of indigenous exercise styles in different ethnic groups will facilitate higher participation than the simple adoption of standard aerobic exercise reported in the literature (Oken *et al.*, 2006; Lam *et al.*, 2012). While many more data are required to examine the neural basis of different lifestyle intervention, one also needs to identify a suitable curriculum for cognitive enhancement. Participation is likely to be enhanced if program complexity is adjusted to the changing needs of the individual when physical and cognitive status varies.

Other than the above, self-efficacy has been considered as one of the major motivational factors in both initial commitment and long-term maintenance of lifestyle modification. For

older adults with a sedentary lifestyle as well as declining physical resources, the sense of being able to master a physical exercise program could be challenging. Similarly, the ability to enroll into cognitively demanding activities may appear unapproachable for people with a deprived educational background and a certain degree of cognitive impairment. Self-efficacy training may be enhanced through performance accomplishments, vicarious learning, verbal encouragement, and attention to physiological and affective states (Lee *et al.*, 2008). A perspective from the cognitive behavioral approach may be integrated into the intervention programs. It will be crucial that program details offer accurate but positive feedback to enable participants to appreciate that progress, no matter how small. Self-efficacy in memory function should be addressed and enhanced through training to appreciate changes in cognitive and emotional well-being accomplished through lifestyle intervention. As the natural course of aging will be more toward a deteriorating path, continuous appraisal of small improvement or stabilization throughout the training period will require professionals to be sufficiently sensitive and equipped with required psychotherapeutic skills. Mindfulness-based cognitive approaches may also be considered as suitable alternatives (Williams and Kuyken, 2012). As continuous improvement will not be the main focus, the emphasis on the present moment with appreciation of the self and the environment may help to foster self-efficacy and attenuate mood symptoms. The effectiveness of integrating psychotherapeutic principles into lifestyle interventions should be examined in future research, in particular the effect on adherence beyond the designated intervention period.

Conclusions

The long-term goals of lifestyle interventions, besides promoting health in general, would be for optimizing brain reserve and enhancing cognitive function. The commitment for change will demand adequate appreciation of potential benefits and a determination for better health state in later life. Barriers to engagement and adherence are major hindrance to success. A more thorough exploration of facilitators in intervention trials should be considered and its impact on long-term clinical outcomes evaluated.

Conflict of interest

None.

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