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Aquamentia©, Introducing a Newly Developed Swimming Intervention for People With Dementia

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Aquamentia® is an experiential movement program for aging people suffering from dementia. The program is based on a series of researches about the effects of dementia on the body, emotions, and cognition, but also on social aspects such as interaction (Physical, Emotional, Cognitive, Social). This is combined in a context with a therapist for movement in water. The foundation for this program rests on well-known methodologies such as those by Halliwick, Ai Chi, and Watsu. These methodologies contributed to elements of the program compatible with PECS for aging people with dementia. All of this fits within the methodology of personalized healthcare. A first pilot effect study will be done in the short term. This article gives an overview of the reasons-, the theoretical framework-, and the contents of this project.

Keywords: dementia, aquatherapy, healthy aging, swimming

Introduction

This article gives an overview of the reasons-, the theoretical framework-, and the contents of the Aquamentia® program. Aquamentia® is an experiential movement program in water, for which the somatic experience is inextricable bound to the movement experience. The program focuses on the target audience of people with (different stages of) dementia. This audience moves in water for 45 minutes once a week to enhance the physical, emotional, cognitive, and social aspects of wellbeing, or to maintain these types of wellbeing as long as possible. This with the purpose to maintain and stimulate quality of life.

Dementia

Dementia is a progressive neurological condition in which nerve cells in the brain die. The average duration of life with dementia is eight years. The general course of the disease differs per person, and is influenced by the type of dementia. For all types of dementia cognitive functions like planning, dividing attention, set shifting, impulse control, and inhibitions are influenced until finally it becomes impossible to function independently (Papma, Bekkenkamp, Willemse, & Meijer, 2016; World-Health-Organization, 2016). The loss of self-reliance has a large impact on the patient, the family and eventually on the healthcare infrastructure. According to the World Health Organization (2016) dementia is one of the major causes of disability and dependency among older people worldwide. Worldwide there are about 47.5 million people who have dementia. And every year there are 7.7 million new cases.

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Dementia and Movement

Movement is an essential part of an enriched environment—an evironment in which many sensory impulses are experienced (Scherder et al., 2014). An enriched environment supports the plasticity or growth of the brain (Angevaren, Aufdemkampe, Verhaar, Aleman, & Vanhees, 2008; Christie et al., 2008; Ekstrand, Hellsten, & Tingström, 2008; Scherder, 2014; Wang, Xu, & Pei, 2012). Intense movement helps blood circulate through the brain (Vigorito & Giallauria, 2014). This is why it is not surprising that several systematic reviews found the positive effect of movement on cognition (Groot et al., 2016; Laver, Dyer, Whitehead, Clemson, & Crotty, 2016). Despite these promising results, it seems to be difficult to get people with dementia to move. One of the causes of this could be that most people with dementia are elderly. Next to their dementia they have to cope with the regular factors of an aging body such as reduced vision, reduced brawn and sense of balance, incontinence and medication. These factors do not contribute to self-confidence or success experiences in movement. In the worst case scenario they can even result in falling with all the (immobilization) consequences thereof.

In the context of healthy aging, important aspects are self-management of illness or handicaps, physical and cognitive functioning, and active participation Because of the consequences of dementia, both the possibility to self-manage and cognitive functioning keep on decreasing. The other aspects can be influenced through coached movement activities. Movement activities can be done far into the demention process, and as such physical functioning can be maintained. The social production function theory (Ormel, Lindenberg, Steverink, & Verbrugge, 1999) [Figure 1] holds that all items are connected to each other. So movement can contribute to the quality of aging life with dementia by increasing participation and support.

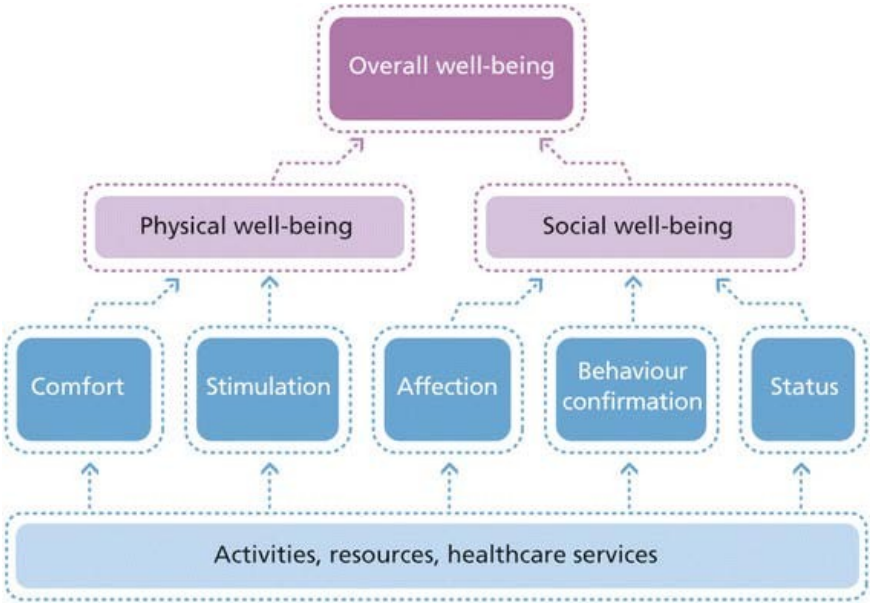

Figure 1.

Movement in Water

Watertherapy is used for different orthopedic, cardiovascular, and respiratory diseases. The fact that watertherapy is also potentially beneficial for neurological conditions is supported by a growing number of

researches. In the studies of Hildenbrand, Becker, Whitcomb, and Sanders (2010), Pugh et al. (2015) and Sherlock, Hornsby Jr, and Rye (2013) the positive effects of being submerged in warm water on the blood flow to the brain, noting increased brain activity in healthy people is described. Both Becker and Sato et al. (2012) describe that the best results are found when there's medium intensity movement in water.

Besides this Becker (2009) notes that being submerged in warm water also causes reduced activity in the sympathetic nerves, and that the balance between parasympathetic and sympathetic nerves is getting restored. Combined with an increased blood flow, this could mean a positive effect on the functioning of the working memory, spatial orientation, and higher processing time in the brain. Different case studies (Neville, Henwood, Beattie, & Fielding, 2014) (Becker, 2014) in which specific water movement programs for aging people suffering from dementia were researched, found that there was an increase in quality of life and in one specific case also an improvement in cognitive functioning. Case reports of improved cognitive function in Alzheimer's disease, and studies in traumatic brain injury, autism and ADHD have shown significant benefits from aquatic immersion with exercise (Becker, 2014).

The systematic review by Waller et al. (2016) concluded that water specific activities for the elderly had an average to very high effectiveness in improving bodily functions, body structures, activity, and participation.

Next to these physiological effects water is also a context with a high sensory-motor component. Even when just entering the water, different (personal) sensors are activated by the thermodynamic aspects and the water current. The water density, pressure, and upthrust are felt more strongly as water depth increases. These aspects help people with dementia to stay in the here and now, they have to (un)consciously directly interact with the water context. Water density causes resistance when moving, and can as such be used in fitness and strength improvement. Water pressure can be experienced as pressure on the chest and cause trouble breathing, for which psycho-education is important. The up thrust/upwards force greatly reduces strain on joints and the spinal column compared to exercises on land, which makes movement easier. The upwards force however also causes instability in the water which causes (unwanted) rotations around different axles.

The high density of water makes movement for aging people suffering from dementia safer as well. Their sense of balance is more easily disturbed, but falls get much delayed. The delayed fall can usually give enough time for the reflex to catch oneself to activate, so that they actually recover before falling completely. If this reflex does not activate sufficiently, then falling still does not damage limbs, but it can influence emotional aspects (fear) and breathing by choking on water.

Participation/Inclusion

People in different stages of dementia, from light confusion, time confusion, till the phase of continual movement, can participate in Aquamentia®. People in the vegetative state are excluded. To take part in the Aquamentia® program, people with dementia have to be screened beforehand by their doctor/physician. Their basic fitness needs to be good enough for the trip to the swimming pool not to be overly exhaustive. Next to this all other conditions that normally exclude someone from movement in water also apply for Aquamentia® , specifically (open) wounds. Psychogeriatric conditions do not exclude someone from participating unless the safety of either the aged person with dementia or the therapist cannot be guaranteed.

Aquamentia®: Aims of the Program

The general effects of movement in water have been described earlier in this article, however the systematic review by Daly, Rodinova, and Ogonowska-Słodownik (2013) described the effects of hydrotherapy more specifically for the elderly. A selection of conclusions from the systematic review:

- The aerobic capacity increases or does not decrease when the intervention is specifically aimed towards this and is done for long enough
- Balance increases when specific exercises are done towards that goals
- Muscle power increases

Another conclusion was that there's been little research on participation, self-efficacy, or compliance. When developing the Aquamentia® program we included interventions for these aspects.

The aims of the Aquamentia® program are focused on physical (P), emotional (E), cognitive (C), and social (S) aspects of wellbeing and are formulated as follows:

- Maintaining and improving physical balance (P)
- Maintaining and/or improving cognitive balance by means of experiencing pleasure, challenge, and of tension and relaxation (E and C)
- Maintaining and/or improving contact with the self, others, and the surroundings (S)
- Improving physical force (P)
- Improving confidence (E and C)

To work towards these goals the therapist needs to create fitting movement situations in which the aged person with dementia experiences many successes and happiness. For this purpose Dementia Care Mapping (DCM) is used, in which three phases are systematically employed, name observation, feedback, and action plans (van de Ven, 2015). Every aged person with dementia gets personalized learning goals that match the general aims of the program.

Aquamentia® is an experiential method in which physical movement is inextricable bound to the movement experience. According to the principle of feeling (the physical experience), acting (moving in water) and thinking (the meaning that the aged person with dementia gives to the activity) water specific activities are offered. The attitude of the therapist is supportive, structuring, and attentive. Because of the reduced cognitive functions, psycho-education also plays a recurring role in the program.

The therapist invites an aged person with dementia to engage in an activity in which one of the aspects of PECS is central. For example an activity in which legs needs to be used with force (P), to feel something (E), to ask how the participant thinks they will do an activity (C), or by means of engaging in a conversation and smoothly transitioning into an activity. Songs and music are also used—especially songs from the patient's past can support movement activities.

Coaching in the Aquamentia® program is on a system of one therapist per one aged person with dementia. The therapist encourages the aged person with dementia to do as much as possible themselves, and only helps physically when requested. Support is decreased over time along the disengagement principle from the Halliwick method (Lambeck & Gamper, 2010). Besides individual activities, in the Aquamentia® program the therapist also strives to connect the participant with other aged people with dementia. This is one of the ways in which the program tries to improve contact with others (S). Fun and challenge are at the heart of these activities. An example is for instance playing catch with a light beach ball with other patients. Without a ball the patient's

movements are generally smaller and more careful. With a ball the aged person with dementia focuses their attention on the ball while playing catch, so that balancing actions are done almost without thinking.

Water specific methodologies that support the aims of the Aquamentia® program—and for which the methodical sequences are clearly indicated—are primarily the Halliwick method, secondarily Ai Chi, and in specific situations Watsu.

Halliwick

Halliwick (Lambeck & Gamper, 2010) is a method that helps unskilled prospective swimmers to learn to safely move in water as self-reliantly as possible. This method teaches the swimmer to deal with the balance-aspects that occur when moving in water. This method was originally developed with swimmers with a physical disability, but is also effect when (re)learning movement in water. The Halliwick method provides a planned way to help swimmers who cannot directly engage with water because they literally become unbalanced. The Halliwick method contains ten steps of which steps one through six play an important role in the Aquamentia® program.

Step 1, the mental adjustment phase, is meant to get the aged person with dementia in the Aquamentia® program accustomed to the water. In this phase all activities are in a vertical position and a connection is maintained to the bottom of the pool. For this target audience a vertical posture is important because in that way they can still use all senses optimally to maintain balance and contact with themselves and the other. The contact with water can be more easily adjusted this way because orientation stays the same as on land. The waves, currents, and up thrust/upwards force however do require a different answer than movement on land. Furthermore these mechanical aspects of liquid are not stable but constantly shifting when the body is moving. This requires that the aged person with dementia balances themselves constantly, and this makes that the first experience is generally hard work instead of relaxing. The therapist needs to adopt an understanding and empathetic stance to respond to the possible fear, but also a stimulating and activating stance by calling out success experiences and to reassure the person by focusing on how safe the context of swimming is.

Another important goal in the mental adjustment phase is to regulate breathing. Because of the water pressure many aged people with dementia experience trouble breathing even just in chest-high water, which they usually indicate as a sense of pressure on the chest. Many aged people with dementia associate this pressure with heart or respiratory problems. Psycho-education in which the attributes of water pressure are explained, and which focuses on consciously experiencing the difference of pressure when going from shallow water to deeper water and back to shallow water again, helps the aged person with dementia to relax and provides the courage to keep moving. Eventually the aged person with dementia has to be able to maintain a vertical pose by themselves, and be able to relax in the water and exhale before the next phase can begin.

The next phases are focused on rotation control to increase balancing skills and to get to a point where the person can calmly move from a standing pose to a back-float and vice versa. The choice for back-floating is based on being able to breathe freely without burdening the spinal column as happens in the stomach-float. This helps prevent back complaints. Only when the aged person with dementia can independently move to and from a back-float in a relaxed way is it possible to move towards a backstroke. For some aged people with dementia this will not be possible, but they can find enough challenge in the other phases to experience success experiences and enjoyment.

Ai Chi

In the Aquamentia® program we also use a number of breathing techniques from Ai Chi. Ai Chi can be best described as doing a series of large slow movements for which no strength is required and the movement speed is connected to one's breathing (Lambeck & Bommer, 2010). Ai Chi moves fit well in the mental adjustment phase because attention is paid to breathing and relaxed movement. Breathing in and out deeply, causes a constantly shifting upthrust/upwards force (more so when breathing in) and a changing body density (lower when breathing in). This means that when inhaling the capacity to float increases and it gets harder to remain standing. So in these exercises the sense of balance is also practiced without movement in the water. This provides a safe way to practice for many aged people with dementia which allows for more experiences and sensory input.

Watsu

The Watsu method can be used for relaxation. In this approach the aged person with dementia is physically aided by the therapist. The therapist firmly supports the head of the patient with one arm, and uses his other arm to support the lower back of the patient. With this method, which was originally based on Shiatsu, the aged person with dementia is moved to a back-flout in order to completely relax. This works well when the aged person with dementia is tense but accustomed to the water. Experience shows that the aged with dementia can get so relaxed that it can become difficult afterwards to return to a stable upright position. Other aged people with dementia can get too tense from just lying in the water, because they lose touch with their surroundings as they only see the ceiling and their hearing is impaired because their ears are submerged. Ears filled with water also impacts the inner ear, which in turn influences balance. Because of this the Aquamentia® program only uses Watsu in specific situations.

Conclusion

With the social production function theory as a starting point (Steverink, 2002) Aquamentia® influences the wellbeing of aged people with dementia in several ways. The PECS based goals return in different aspects of the model.

Offering activities is a form of stimulation and the context of water gives extra stimuli because of the mechanical aspects of liquid. The affect is influenced because coaching follows the principles of personalized healthcare, which allows the dependant person to be recognized as a unique individual (van der Cingel & Jukema, 2014). Participants experience success experiences in the water that are often no longer possible on land, and these experiences contribute to status. The water temperature (33°C) helps the patients to relax and the upwards force causes reduced strain on the joints which also influences comfort.

In the near future a *pilot study* will be done into the effects of the aspects of the program mentioned in this conclusion.

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