Marek Małysa

"BRIDGE – DEMENTIA PREVENTION OR ALZHEIMER THERAPY AS WELL"

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COGNITIVE ACTIVITY IN ELDERLY

As life expectancy increases, the percentage of people over 65 years old in population will soon cross 25%. We have to find ways to help them maintain good health including brain health.

In 2011 WHO (1) signalized increasing risk of dementia. One of the recommended strategies is promoting cognitive activity which could probably prevent or delay the onset of dementia.

In GCBH (Global Council on Brain Health) Recommendations on Cognitively Stimulating Activities (2 GCBH 2017) we can find following „consensus statements":

- learning a new skill, or engaging in leisure activities that are mentally challenging (challenge a person's ability to think), provide benefits for adult brain health,
- these activities can help you maintain your brain and cognitive abilities, such as your memory, thinking, attention and reasoning skills as you age,
- observational studies suggest that cognitively stimulating activities may enhance a person's cognitive reserve and this may allow people to cope better with age-related brain changes as well as may reduce a person's risk of developing dementia due to Alzheimer disease and reduce the severity of symptoms if a person develops the disease,
- most commercial products marketed as „brain games" are not what GCBH means when discussing the benefits of cognitive training,
- training on a specific cognitive ability may improve that ability even when a person has mild cognitive impairment (MCI),
- a few studies examining the long-term effects of cognitive training have shown continued benefit even after training stops.

"FINGER Study of Multidomain Two-Year Randomized Trial to Prevent Cognitive Impairment" published at Alzheimer Prevention Bulletin January 2013 (3), cognitive training and social activities are included with significant effects.

In "EPIDEMIOLOGY", 2016 Sept 27, "Late-Life Cognitive Activity and Dementia" (4) Sajeev & Coauthors conclude: "*Our systematic Review and Bias Analyses provide support for the hypothesis that life-long cognitive activity offers some reduction in AD and all-cause dementia risk. However, more data are needed to confirm this relationship (…)*".

In "STAJE", 28.05.2015 edition (5), we can find the following recommendations based on research:

- brain plasticity effectively endorses something that long been suspected: the more we use our brains, the better they work,

- mental exercise can successfully hold off the onset of dementia, albeit not prevent it forever.
In Alzheimer Prevention Bulletin 18.10.2016 (6) we can find dr Blacker from Psychiatry of Harvard Medical School confirming what's in (4).

The cognitive activity was significantly associated with reduced risk of dementia. "*The results were similar for Alzheimer disease (AD) and vascular dementia. In linear mixed models, increased participation in cognitive activities at the baseline was associated with reduced rates of decline in memory*" reports J. Vorgese (7). He and his team made his research on a cohort of 469 subjects 75 years of age without dementia on the baseline. Through 5 years dementia developed in 124 subjects.

Analysing reports of A. Engving, Journal Alzheimer Disease 2014,41,779-791 (13) and L. Maffei Sci.Rep.2017,7,39471 (14) we can define conclusion:

"**Multi-cognitive training in older adults can mitigate age-related and functional alternations in the brain, thereby helping to reduce or delay age-related cognitive decline, which in turn supports accomplishments of everyday tasks and independent living**".

The similar conclusion we can find in American Psychology, 2016 May-June;71:268-275 (11): "*Behavioral prevention strategies can help maintain high levels of cognition and functional integrity, and can reduce this social, medical and economic burden associated with cognitive ageing and age-associated neurodegenerative diseases*".

Most interesting and depth review of possible interventions into healthy ageing and cognitive stimulation presents R. Ashworth, Prof. Samantha Punch and Dr Caroline Small (10) confirming all cited above conclusions. They also are trying to answer if Bridge card game is linked to dementia.

Therefore, the report of National Academies of Science, June 22, 2017 (8) must be surprising. NAS, Engineering and Medicine committee has concluded that current evidence does not support a mass public education campaign to encourage people to adopt specific interventions to prevent cognitive decline or dementia. But on the other hand, the committee also cited "encouraging although inconclusive" evidence for, among others, cognitive training.

Cognitive training – interventions aimed at enhancing reasoning, memory and speed of processing.

In my opinion, they did not want to give support to offered commercially computer-based training applications.

WHY BRIDGE SEEMS TO BE THE MOST COMPLEX COGNITIVE ACTIVITY?

Card game called Bridge is, from the theory of games point of view, random decision game. It is also only one and very last mind sport where a computer program did not beat World Champions.

"*Bridge players plan ahead, they use working memory, they deal with sequencing, initiation and numerous other higher-order functions with which dorsolateral cortex is involved*" reports prof M. C. Diamond from The University of California, Berkeley Nov.2000 (9). She also reported her earlier research results: "***Playing bridge lowers a chance of developing Alzheimer disease by as much as 75%".***

Very first research connected with Bridge has been reported in 1990 by L. C. Smith and A. A. Hartley in Gerontological Society of America (17). "*Results indicated that the players outperform nonplayers in measures of working memory and reasoning however the rival hypothesis that bridge playing selects for individuals who perform better at working memory and reasoning tasks could not be rejected*".

Joseph Coyle, a professor of psychiatry and neuroscience at Harvard Medical School, analysing Vorgheses study asked: "*How can molecular determinism of Alzheimer disease be trumped by elderly peoples card-playing?*" and answered his question: "*using the mind causes rewiring of the brain, sprouting new synapses….it may cause the generation of new neurons*", "*so psychology trumps biology*." (15)

From cooperation between Dutch Bridge Federation and Mulier Institute findings presented in NIVEL in 2011 and 2012 (12) are as follows: bridge provides a social network, bridge effectively counters loneliness, bridge raises happiness.
Dutch Bridge Federation (NBB) on that base started very first social bridge promoting program "Denken & Doen" ("Think and act").

Researchers at the University of California, Irvine studying group of more than 14.000 people 65+ have shown that people who play Bridge on a regular bases show a reduced risk of developing dementia and other ageing debilitating diseases i.e. Alzheimer (16).

"STAJE" – Supporting Jewish Baby Boomers (5) reports:

"*Bridge is more than just an enjoyable pastime. Scientific studies have shown that playing bridge has demonstrable benefits for mental fitness and brain health in seniors. Specifically, playing bridge is particularly effective at delaying the onset of Alzheimer and other forms of dementia. The complex rules, bidding structure, and social interaction…force the brain to create new connections and prevent the build-up of the amyloid deposits shown to cause Alzheimer*".

Finally, once again we look into (10) Ashworth, Punch and Small exploring the links between Bridge and dementia. After very complex neurological and sociological review we came to an important

message from Wenisch (18): "*recent evidence demonstrate that cognitive stimulation therapy can give positive impact also in people with Mild Cognitive Impairment*".

One of the conclusions of their review is: "*It is unclear from the research available whether people with dementia can learn or play Bridge, but the potential for it to be a cognitively stimulating and social interactive activity suggests it is worth considering in more detail".*

My conclusion is that we need more research to be run and to prove that particularly Bridge, as high-level mind activity, is good and can be recommended preventive strategy against dementia as well as can be a part of therapy for people with MCI.

In December 2017 at Nicolaus Copernicus University in Toruń (Poland) the very first in Bridge International Scientific Conference took place. It was dedicated to this game only. Scientists from Scotland, Netherlands, Italy, France, Croatia, Hungary, Norway and Poland attended two-day meetings.
Presidents of World Bridge Federation (WBF) and European Bridge League (EBL) were also there. One of the effects was establishing "Bridge & Science Committee" of WBF.
Committee member Prof Samantha Punch from University of Stirling (Scotland) started research on Sociology of Bridge and soon very first PhD will be promoted there.

In Poland Foundation "Bridge to the People" started scientific research, in cooperation with Nicolaus Copernicus University Educational Department, Cognitive Laboratory and its Collegium Medicum. Later also Gdańsk Medical University declared cooperation in research. More about Foundation in Appendix 1.

Later two more International Scientific Conferences about Bridge took place in Toruń again in 2018 and Zagreb (Croatia) in 2019. The Fourth Conference is scheduled for July 2021 in Scotland.

BRIDGE FOR MCI PATIENTS IN ALZHEIMER CENTER IN WARSAW RESEARCH

Objective

In April 2018 Alzheimer Center in Warsaw accepted bridge lessons for their patients with Mild Cognitive Impairment. Following GCBH recommendations (2) we tried to check if MCI patients can learn new skills and play a simple version of bridge. We found the management of Alzheimer Center open for this experimental method of, what we hoped to be, therapy.

Design, Patients

We got 20 volunteers being patients of Alzheimer Center (out of 120 brought to the Center by their families every day) there who wanted to learn bridge. Initially, they could not count to ten and keep cards in hand properly and none of them played bridge before.

All of them with diagnosed Alzheimer Disease (AD). Shortly only 13 of them stayed in the group which we called “bridge”. Dropouts were caused by unacceptable behavior or other health problems.

Same time we selected “control” group from outstanding patients also with diagnosed AD and reduced them to 13 persons similar to “bridge” one in terms of age and gender.

Both groups had standard therapies during all research period. Additionally “bridge” group had once a week 3 hours lessons of this game and later just playing bridge. The Project was designed for one year for research purpose and is still continued as therapy.

Baseline parameters

All patients from both groups were tested with Mini-Mental State Examination (19) and average results in “bridge” group was 25,3 and “control” one 24,7.

Both groups had 10 female and 3 male members with an average age in “bridge” group 81,15 and “control” 81,53.

Bridge lessons

None of our patients played bridge earlier in his life so rules of the game were for them totally new. Having problems with counting, adding or deducting they slowly started to do it correctly. Week by week, in 3 hours sessions divided by 15 minutes break, they made progress. We did not teach them bidding so they had to play or defend given contract. After 6 months 13 of them (out of initial 20) played a regular game and stayed in the group. Counting to 40, adding and deducting was not a big problem anymore for those who stayed. If we consider that initially they had problems in counting to ten and keeping cards properly in hand, return to using mathematics is impressive. Some of them played also at home with families when taken from Alzheimer Center in the afternoon.

In teacher’s opinion, there were no significant changes in cognitive ability during this one year of bridge lessons. Even now when we continue therapy already 2 years no decline is observed.

Outcome measures

After one year of our experimental lessons all of them were measured by the same Mini-Mental

State Examination and results were as below:

Table 1. Bridge group

			MMSE	MMSE
No	Female / Male	Age	Initial	Final
1	F	90	30	26
2	M	70	22	27
3	F	96	27	26
4	F	67	25	25
5	F	83	22	21
6	F	83	29	27
7	F	79	29	27
8	M	89	27	27
9	F	92	27	24
10	F	95	26	19
11	M	73	26	27
12	F	60	18	17
13	F	78	21	20

Table 2. Control group

			MMSE	MMSE
No	Female / Male	Age	Initial	Final
1	F	89	27	21
2	M	77	24	26
3	M	83	24	18
4	F	80	25	19
5	F	76	25	27
6	F	78	25	25
7	M	89	18	15
8	F	86	23	23
9	F	83	29	27
10	F	88	22	21
11	F	75	27	22
12	F	85	26	26
13	F	73	26	17

- for **“bridge**” group average results of the final test was 24,8 so **the loss of cognitive ability 1,22 points,**

- for “**control”** group average results of the final test was 22,07 so **the loss of cognitive ability 2,63** points,

According to Folstein scale (19) of MMSE “**control**” group on average **dropped to lower level**.

Even if the loss in the “control” group was more than double against “bridge” one this difference is not statistically significant. T- test didn’t confirm that fact so it may happened that this difference is incidental. However Important is that even patients with MCI can learn new skills. Knowing that bridge is most complex and difficult mind game, as well as the only one where computer program cannot beat World Champions, the fact that new skill they got is just bridge is impressive.

We can clearly say that bridge can be treated as one of the best therapies for patients with diagnosed AD at the MCI stage. Of course, it can be also an important part of any multi-domain strategies to prevent dementias.

Deeper and wider in terms of evaluating methods studies and research are needed and “Bridge to the People” Foundation is going to start it as soon as possible. Of course, it is no longer possible to make low cost like pilot one we just presented.

BRIDGE AS DEMENTIA PREVENTION RESEARCH

Following NAS (8) recommendations, in June 2019, Foundations “Bridge to the People” research team (Team presented in App.2) started pilot study how bridge can prevent dementia in an elderly. Later the same team will make bigger research on the base of pilot study results.

Objective

“Bridge as dementia prevention” was designed to assess the efficacy of learning and playing bridge on change of cognitive ability in people over 60 years old. The pilot study started in two Welfare Homes in Toruń (Poland) and will take 6 months.

Design, Patients

45 people over 60 years old selected randomly from 270 residents of two Welfare Homes were divided into 3 groups of 15 people each:

- bridge group,
- bridge and physical exercises,
- control without bridge lessons and physical exercises.

Most of them had various health limitations, some of them on wheelchair , some with MCI but not diagnosed as Alzheimer disease

All of them were initially tested with:

- Brain-Derived Neurotropic Factor (BDNF) as studies suggest that neurotrophic factor have protective role against amyloid-beta toxicity (20),
- Mini-Mental State Examination (19),
- Clock Drawing Test (21),
- Geriatrics Depression Scale (22),
- PERMA test (23).
- other tests of physical abilities.

After initial tests bridge lessons and play were applied to “bridge” and “bridge and physical exercises” groups, 3 hours a week in the distance of 20 successive weeks.

Interventions

Lessons of the game bridge, most brain activating mind- game, started with so-called mini-bridge where cards are open and the teacher is explaining rules of the game. Important is to start the real game as soon as possible to avoid early dropouts. After 3 weeks of “open game” residents started normal supervised play. Only a few of them had to stay on a mini-bridge level longer due to their cognitive limitations.

Same time physiotherapists had two hours a week exercises with “bridge and physical exercises” group in addition to bridge lessons and play. All exercises were appropriate to physical restrictions.

Outcome measures

The primary outcome measure is the change of cognitive ability in all groups. We will make again tests: MMSE, CDT, GDS and PERMA. Initial and final results of every individual in every group will be processed and discussed. Final tests are just running but slowly because of COVIN-19 problems.

We expect results analyses being ready in few months.

On that base future research plan on a higher number of participants will be defined.

The future continuation of research

Research on bridge as dementia prevention strategy as well as bridge as Alzheimer Disease therapy will be continued by “Bridge to the People” Foundation later in 2020 and in 2021.

Its size depends on funds we will be able to collect within short.

BRIDGE AS DEMENTIA PREVENTION IN PRACTICE – BRIDGE 60+ PROGRAM

Following M. C. Diamond research results (9) I started with Polish Bridge Union program called BRIDGE 60+. The main goal of this action was to get as many as possible elder people to bridge into BRIDGE60+ centers created by me. We wanted to take elder people from social isolation.

In generally retired people in Poland are relatively poor, and the program was addressed especially to them. That is why in BRIDGE60+ centers, everything is for free. Bridge equipment, bridge books and bridge courses costs were sponsored by Ministry of Social Care within their project ASOS (Social Activation of Elderly) and one of insurance companies.

Starting from 2014 till now **310** special places for BRIDGE 60+ were created and supplied. More than **13.000** people started playing bridge and continue to play. We can say that the same number (310) of small social groups people from the neighbourhood, having also other kinds of common activities, started in all the country. From a small village to big cities.

Program BRIDGE 60+ is still developing also in other countries. I presented the program at Zonal Conferences of World Bridge Federation in Medellin, Cape Town, Singapore and Belfast. During The WBF Congress in Orlando, I refered BRIDGE 60+ idea to all other Federations. In several countries program started under various names.

I'd like to express my warmest thanks to: European Bridge League, Polish Bridge Union, Israeli Bridge Federation, Educational Foundation ACBL and our private donors Patricia Cayne, Daniel Zagorin and Georgis Bogdanis.

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APPENDIX 1

"Bridge to the People" Foundation

Established in 2019. Foundation main and only purpose is to finance and run scientific research how playing bridge prevents and/or delays dementia (particularly Alzheimer disease), prevents social isolation of elderly and to promote research results.

Foundation is non- profit and all people involved in its activity work voluntarily.

Foundation President:

Prof Piotr Błajet

Foundation Council:

Marek Małysa – chairman

Anna Bogdanis – v-ce chairman

Krzysztof Berlikowski – member

Foundation Scientific Council:

Prof. Bruno Vellas (France) – University Toulouse

Prof. Samantha Punch (Scotland) – Stirling University

Prof. Wlodzisław Duch (Poland) – Nicolaus Copernicus University Toruń

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APPENDIX 2

RESEARCH TEAM

Prof Kornelia Kędziora - Kornatowska

Head of Department of Geriatrics Nicolaus Copernicus Copernicus University in Toruń, Collegium Medicum in Bydgoszcz since 2001. She earned her PhD in 1993, her habilitation in 1999. She received the title of professor in 2009. Her research focuses on ageing processes and diseases of an elderly („of ageing" and „in ageing"). For the last 18 years, she has been conducting various studies of molecular, neuropsychological and clinical aspects of ageing and age-related diseases. She published numerous peer-reviewed articles and coauthored several books in topic of gerontology. She also took part in several studies in the field of clinical gerontology. Among them was "Polsenior" project exploring medical, psychological and socio-economical aspects of ageing in Poland (2006-2010) in which she had the lead role, as well as GRADYS program which looked into practical applications of virtual reality (VR) in enhancing cognitive functions in elderly (2014-2016). She is Editor-inChief of "Polish Gerontology", an official journal of Polish Gerontological Society, and Dean of Faculty of Health Science, Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Toruń (since 2012).

Prof Krzysztof Rubacha

Head of the Department of Pedagogical Research Methodology NCU, Laboratory of Research Tools at the Polish Academy of Sciences, and an Editor-in-Chief of the Educational Studies Review. He deals with the methodology of scientific research: social and natural, statistical analysis of data, designing the research process and conducts empirical research on the psychosocial functioning of adults. He is the author of many tests to measure the level of self-fulfilment, ethical orientation, educational strategies, performing social roles, and implementing adult developmental tasks. He received a doctoral degree at the University of Warsaw in 1994, a postdoctoral degree at the Nicolaus Copernicus University in 2000 and the title of professor in 2010.

Prof Piotr Błajet

Head of the University Sports Center NCU. Member of The Scientific Committee of The World Bridge Federation. He deals with health education, sport pedagogy, conducts empirical research on the psychosocial aspects of development in adulthood. He received a doctoral degree at the Academie of Sport in Warsaw (sports physiology), a postdoctoral degree at the Nicolaus Copernicus University in 2006 and the title of professor in 2014.

Marek Małysa PhD

Retired math teacher at Gdańsk University of Technology (PhD in 1985) still teaching there but now giving bridge lessons to students and professors as well.

V-c President of Polish Bridge Union and Board Member since 2012.

The on-site organizer of World Bridge Games in Wrocław 2016 (former bridge Olympia).

Author and leader of BRIDGE 60+ program. Motto „Bridge against dementia and social isolation" tells all about its aims. Within 5 years more than 270 centers were created to allow an elderly to learn bridge and play later on as an alternative to staying at home and waiting for…

The program was accepted by 23 countries in Europe and presented also in South America, Africa and Asia Pacific region.

Author of „Play bridge with grandchildren" project, connecting generations.

Chairman of BRIDGE & SCIENCE Committee World Bridge Federation, member of Senior Committees World Bridge Federation and European Bridge League.

Bridge expert in NukkAi project – Artificial Intelligence trying to win with World-class players.

Co-organizer International Scientific Conferences dedicated to the game of bridge.

As bridge player participated in several World and European Championships.

Captain of Polish National Youngsters Team at European Championship in Wrocław and World Championship in Istanbul.