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HEALTH PSYCHOLOGY | RESEARCH ARTICLE

Exploring the possible application of implementation intention on prospective memory of cancer patients

Giulia Marton^{1,2*}, Luca Bailo^{1,2} and Gabriella Pravettoni^{1,2}

Abstract: Prospective memory defines the ability to remember to perform an action related to a specific task planned for the future. Interventions aimed to improve prospective memory have an impact on the patient's quality of life. While most interventions are aimed to improve prospective memory in general, implementation intentions influence specific automatic processes related to prospective memory. The efficacy of this type of intervention has been proven on different samples of patients as well as on lay people. We argue that, while in cancer patients who suffer from perspective memory deficit this particular intervention has not been studied yet, it could be usefully implemented to foster patients' involvement, quality of life and adherence to care.

Subjects: Health Psychology; Memory; Oncology

Key words: prospective memory; implementation intention; chronic disease; cancer; self-care

Prospective memory is a specific form of memory that defines the ability to remember and to achieve a specific task planned for the future (Kardiasmenos et al., 2008). This process allows individuals to remember that they have to do something in a specific moment that is yet to come (Schnitzspahn et al., 2011; Winograd, 1988).

The application of this ability can be distinguished in two types of situations: the first one is time-based memory that allows, for example, to remember to go to an appointment at a given time; the latter is event-based memory that allows a person to remember to perform an action when a specific

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The research group focus is on psycho-oncology and the impact that the disease has on the patients' lifestyle. The emphasis of the research group is on cognitive science and on medical decision-making processes.

PUBLIC INTEREST STATEMENT

Cancer has a big impact on the patients' lifestyle. In particular, cancer and its treatments could impact cognition and prospective memory.

Prospective memory effects are on the ability to plan a specific action for the future, for example, remembering to plan a visit to the hospital or taking a medication in a specific hour.

The authors present a new point of view of this problem. Starting from an automatic memory process, it is possible to improve patients' memory and quality of life through implementation intention intervention. These kinds of intervention are based on the if-then strategy and they it could be easily feasible in the patients' daily life. Its efficacy is proved in other samples of patients and on the general population, but not on cancer patients.

event occurs, for example, to remember to ask the physician to fill a receipt at the end of the next appointment (Einstein & McDaniel, 1990; Einstein et al., 1995; Okuda et al., 2007). In health-care settings, this ability is necessary for the patient to take self-care decisions and act on them. Remembering treatment-related tasks, such as chemotherapy sessions and control visits, medication self-administration on specific timeframes and active monitoring for symptoms, requires patients to make active efforts when planning activities and considering unexpected events that may prevent the completion of those tasks in everyday life (Cameron et al., 2010; Currie et al., 2015). Deficits in prospective memory may hinder the ability to complete these tasks and cause significant distress in patients (Graf, 2011; Smith et al., 2000; Terry, 1988; Zeintl et al., 2006), impairing their active role within the shared decision-making paradigm, which is fundamental for the care process (Marton et al., 2020; Monzani et al., 2020; Renzi et al., 2016). Especially when dealing with chronic diseases, optimal care is reached with the contribution of both patient and clinician, and any obstacle to patients' ability to fulfil their individual tasks could hinder the effectiveness of the whole care process, since patients' cognitive and memory abilities have a direct impact on their empowerment process (Kondylakis et al., 2013). The empowerment process can be enhanced by acquiring awareness that their cognitive deficit can improve, thanks to different methods such as psychoeducation and cognitive-behavioral treatment (Bernstein et al., 2018; Ferguson et al., 2007; Halvorsen et al., 2020; Hermansson & Mårtensson, 2011).

To address prospective memory issues in everyday life of people (patients, as well as general population) (Raskin, 2018), several cognitive behavioral interventions proved to be effective (Insel et al., 2016; Raskin et al., 2019). In clinical scenarios, most of these interventions are based on improving patient's memory and cognitive processing such as visual imagery interventions (Griffiths et al., 2012) and self-awareness interventions (Fish et al., 2015): they do not focus on specific scenarios related to specific conditions, hence aim to provide an indirect benefit to patients' self-care.

Since this approach would not tackle specific needs of patients directly, such as remembering a scheduled appointment and self-administering pharmaceutical treatments, we expect that the impact of wide range interventions could be improved by specific interventions related to daily scenarios and event-related actions that could better support patients' efficacy.

From this perspective, a different approach to assess impairments on prospective memory is to focus on interventions providing strategies in specific scenarios for those tasks that are related to the everyday management of patients' condition.

In this viewpoint, prospective memory deficits can be considered as obstacles to goal-related planning that hinders patients' ability to act accordingly to a plan that aims to a long-term objective: their wellbeing. Instead of focusing on developing general mnemonic skills from a top-down perspective, this approach would focus on the development of bottom-up strategies related to the initiation of a goal-related behavior triggered by events and act as self-regulation strategies that lead to goal attainment (Gollwitzer, 1999). In line with this approach, several authors focused on the relationship between implementation intentions and prospective memory considering it as the "gold standard" method (e.g. Chasteen et al., 2001; X. jie X. Chen et al., 2015; Cohen & Gollwitzer, 2008; Gollwitzer, 1999; L. Liu et al., 2020; Zuber & Kliegel, 2020; Jones et al., 2021).

Implementation intentions are defined as "if-then plans formed for the purpose of meeting one's goals" (Gollwitzer, 1993, 1999; Gollwitzer & Sheeran, 2006). As prospective memory deficits undermine the ability to remember an action or an intention planned for a future point in time, implementation intentions rely on if-then scenarios to support the implementation of a planned action in a specific context (Chasteen et al., 2001; Cohen & Gollwitzer, 2008; McDaniel et al., 2008), can provide a substantial support. An example of this implementation in a health-care scenario focused on epilepsy patients (Gollwitzer & Sheeran, 2009). This kind of patients need to take medications regularly for a long period of time and largely benefit from an advance planning that regulates their therapy self-administration with indications like: "if I'm drinking coffee in the morning, then I will be taking my medication of the day". This strategy allows them to associate

the action to take their medicine with a frequent and regular event. If-then planning operates as a link increasing the accessibility of mental representation of obstacles and opportunities that may arise and pushing individuals to behave according to their intention (Gollwitzer, 1999).

Different forms of implementation intentions proved to be effective (X. jie X. Chen et al., 2015), whether it focuses on a verbal form based on the repetition of instructions (Zimmermann & Meier, 2009), an imagery form based on the mental representation of relevant scenes (Brewer et al., 2011) or a combination of the two, in which the repetition of a verbal message is paired to the visual anticipation of a scenario (Chasteen et al., 2001; McDaniel et al., 2008). Empirical data show that, regardless of the variation adopted to implement ahead planning, the technique has a positive impact on improving prospective memory performances (X. jie X. Chen et al., 2015). The research questions that this prospective try to highlight are the usefulness of implementation intention interventions and their role in enhancing prospective memory in cancer patients. Cancer patients have to overcome difficulties that comprehend a change in lifestyle and, more impactfully, of cognition. Memory is largely impacted and a new point of view to tackle the problem could be to implement prospective memory starting from implementation intention intervention.

To address these research questions, we performed a review on PubMed using a combination of the terms: prospective memory, implementation intention and cancer. PubMed search gave us zero results. The lack of articles leads us to deepen our research exploring applications designed for other types of populations. The studies that we decide to include all explain the effects of implementation intention on prospective memory in different populations. Our aim was to consider the effects that prospective memory intervention could have on different populations, based on previous literature, and present a new viewpoint in the field of cancer care, where this kind of interventions have not been considered yet.

In a meta-analysis that investigated the effectiveness of implementation intention interventions on prospective memory, results show a significant improvement on different populations of healthy young and older adults, and on various clinical samples (X. jie X. Chen et al., 2015; e.g. individuals with schizotypal personality features (X.-J. X.-J. Chen et al., 2014); Individuals with memory-impairment (Grilli & McFarland, 2011); individuals with Multiple Sclerosis (Kardiasmenos et al., 2008); individuals with autism spectrum disorder (Kretschmer et al., 2014)).

One example is its application to patients suffering from multiple sclerosis who suffer from a prospective memory deficit. This kind of patients has deficits in both the prospective components and the retrospective components of prospective memory: their deficits can be found during the exact circumstance and when they have to remember to perform an action. After a training of their implementation intentions in which they were asked to play with the modified version of a board game that made them perform an implementation intention exercise, patients showed an improvement in prospective memory performances (Kardiasmenos et al., 2008). The improvement was observed on more cognitively demanding tasks. This result could be explained by the fact that implementation intention interventions operate on more automatic processes enabling better prospective memory performances regardless of the amount of cognitive resources required.

Another example of the effect of an implementation intention intervention regards patients suffering from neurological damage (Grilli & McFarland, 2011). In this study, the intervention was administered by a self-imaginative task: participants were asked to imagine themselves performing an action in a future moment. Results show how an easily accessible exercise could be useful in helping memory impaired patients in tasks based in the real world. Similar results were found in a study that examined the effects of implementation intention intervention on Parkinson's disease (Foster et al., 2017).

These different applications show that implementation intentions interventions have positive effects on different populations, including clinical ones, and different formats may be used to

better adapt it to each population. The intervention implemented on the modified version of the board game is based on verbal and imaginative implementation intentions while, on the other hand, the intervention presented to patients with neurological damage is purely imaginative (X. jie X. Chen et al., 2015; Grilli & McFarland, 2011; Kardiasmenos et al., 2008).

Behavioural intervention aimed to improve executive functions, which has been studied in brain tumor survivors (Richard et al., 2019), but the specific impact that implementation intentions intervention has on prospective memory has not been studied in an oncological population. Despite high mortality rates, scientific advancements in cancer treatment have largely increased patients' survival: 64% of cancer patients reach a one-year survival after the diagnosis and 40% of them survive for more than 10 years (Moor et al., 2014; Rowland & Yancik, 2006). The overall survival rates for patients with a cancer diagnosis are expected to continue to grow. It is estimated that, across all age groups, between the years 2016 and 2040, the number of cancer survivors will grow from the current 15,5 million (4,78% of the total population) to 26,1 million (6,86% of the total population) people (Bluethmann et al., 2016). For this reason, the quality of life of people who survived both acute and long-term treatment phases of cancer gained relevance in the medical scientific community (Blanchard et al., 2004; Demark-Wahnefried et al., 2005; Hoffman et al., 2009; Weaver et al., 2013). This data altered the approach to the oncology care process and focused on cancer as a chronic disease (Capocaccia et al., 2015; Epping-Jordan et al., 2005; Y. Li et al., 2020; Phillips & Currow, 2010; Pizzoli et al., 2019). Cancer and its treatments have an impact on the cognitive ability of cancer patients and survivors. This impact is a complex one, both cancer treatments, such as chemotherapy and surgery, and cancer itself have an impact on the cognitive ability of the patients (Bernstein et al., 2017; Su et al., 2020). In an evaluation of the cognitive deficit of cancer patients, it should be considered the healthcare pathway in its whole: different treatments, side effects and cancer itself all have a specific role in determining cognitive deficit in cancer patients. Considering these effects, the impact of cognitive abilities of cancer survivors on their quality of life needs to be considered with the same relevance of clinical markers in the acute phase of the disease (Joly et al., 2011; Phillips & Currow, 2010). Even though the specific role that some forms of treatment play in the genesis of cognitive deficit in patients is still unclear (Ahles & Saykin, 2007; Hermelink et al., 2007; Jim et al., 2009; Noal et al., 2011; Vardy, 2009), the impact of cancer treatment is often observed and recognize to be of interest (Ng et al., 2016; Rey et al., 2012). A contribution to understanding the link between prospective memory impairment and cancer treatment may come considering the neurological basis of prospective memory. The areas that are involved in prospective memory are the prefrontal cortex, the thalamus, the cingulate gyrus, and the ventral frontal lobe (Dagenais et al., 2016). These same areas are influenced by treatments for different forms of cancer (Chao et al., 2012; Y. Liu et al., 2018; Paquet et al., 2018). For example, this relationship is observed in the treatment of conditions such as prostate (Yang et al., 2015) and breast cancer (Paquet et al., 2013) but also in cancer survivors (Yao et al., 2017). In the latter study, Paquet and colleagues (Paquet et al., 2013) compared the prospective memory of early-stage breast cancer survivors and healthy people. The results show that patients who followed cancer treatment had lower results in memory tests when compared to the control group. Another example of the deterioration of prospective memory after a cancer treatment was given by Liu (Y. Liu et al., 2018) who studied the variation of prospective memory of cancer patients before and after intensity-modulated radiotherapy. Results showed that after the treatments prospective memory performance tests had lower scores. Other studies focused on differences between event-based prospective memory and time-based prospective memory deficits. While both time-based prospective memory and event-based prospective memory performances have been evaluated in cancer patients, event-based prospective memory performance has been observed to bear a higher impairment than time-based prospective memory (Cheng et al., 2013; W. Li et al., 2017; Yang et al., 2015).

These types of evidence demonstrate that an intervention in this area is necessary and could improve patients and survivors' life aspects that are worsened by prospective memories' deficits.

A question arises: could implementation intentions provide a significant improvement to current interventions in the delicate context of oncology treatments?

The needs of cancer patients seem to be well addressed by implementation intention interventions, especially when applied in different issues of the care. For example, McGowan and colleagues (2013) tested the efficacy of two different types of implementation intentions interventions to promote physical exercise in a sample of prostate cancer survivors. The first type of intervention was based on self-administered implementation intention and it was compared with telephone-assisted implementation intention. The results of self-administered implementation intentions intervention were positive and the authors suggested that this kind of intervention could have long-term effects if paired with other support interventions.

The wide applicability and flexibility of implementation intentions allow us to consider this technique as a potential candidate to support cancer patients suffering from deficits in event-based prospective memory (Cheng et al., 2013; Yang et al., 2015).

Implementation intention training could be focused on daily tasks and it could be useful for individuals such as people diagnosed with cancer, to adapt to the new condition they face, for example, remembering to go to the physician's appointments or to check for specific symptoms and to follow the doctor's indications.

Conclusions

These interventions could enhance the overall quality of life of patients, which is a concept of growing attention (Gilardi et al., 2014). Implementation intentions could provide a specific benefit that would easily be included in the care process, allowing patients to have a more effective management of their condition and facilitate the integration of normal life activities and their self-care tasks. Therefore, it would be helpful to consider patients' prospective memory assessment along with long-term evaluations to monitor both the emergence of this deficit and its recovery when interventions are applied. The lack of a prospective memory assessment for cancer patients in a recommended shared practice, like the guideline provided by the International Cognition and Cancer Task Force (ICCTF) (Wefel et al., 2011), may be one of the reasons why not much data are present in literature on cancer patients deficits in prospective memory.

This contribution aims to provide a new perspective on cancer patients quality of life and, as such it has intrinsic limitations. We decided to focus on implementation intention due to the high volume of positive results observed on other fields, both on healthy people and patients. The next necessary step would be to test the efficacy of this form of intervention directly on cancer patients and compare it to other goal management approaches. Another limitation of our perspective is to consider cancer treatments in general without considering implications on prospective memory for specific treatments of cancer diagnosis. While we acknowledge that patients with different cancer diagnosis have specific needs, the lack of literature based on implementation intention interventions for prospective memory within a cancer patient population would not allow us to consider its application in specific scenarios. For example, we think that the effects of antineoplastic chemotherapy should be explored in depth as recent results relate it to cognitive disorder (Kuśmierk et al., 2020). In the same way, attention should be brought to the new paradigm of "emotional chemobrain" (Bou Khalil, 2020) that focused on the effect of chemotherapy on neurobiology and on psychological wellbeing.

Even if different interventions could be useful in helping cognitive deficits of cancer patients (e.g. cognitive training, cognitive rehabilitation, and exercise interventions (Zeng et al., 2020)), future directions should also aim to design, develop and test a tailored intervention to adopt implementation intentions methodology to target specific needs of cancer patients. The intervention should be fostered by the support of an experimenter instructing patients on how to manage tasks thanks to if-then scenarios presented as a feasible, immediate, and adaptable task that fits in patients' daily life. Furthermore, implementation intention scenarios should be self-administrable and, considering the

feasibility of the practice, they could be both imaginative and verbal but, still focused on supporting event-based prospective memory. The main strength of implementation intention technique in the daily life of cancer patients would be its accessibility and it could encourage cancer patients in a process of empowerment that can change their mindset and approach to the care process providing them with a more active stance (Bailo et al., 2019). Patients who experiment with this process gain more control on their daily life activities and can lead them to feel less helpless and consequently empower them even in the more difficult or important clinical condition (Arnaboldi et al., 2020).

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References

- Ahles, T. A., & Saykin, A. J. (2007). Candidate mechanisms for chemotherapy-induced cognitive changes. *Nature Reviews. Cancer*, 7(3), 192–201. <https://doi.org/10.1038/nrc2073>
- Arnaboldi, P., Oliveri, S., Vergani, L., Marton, G., Guidi, P., Busacchio, D., ... Pravettoni, G. (2020). The clinical-care focused psychological interview (CLiC): A structured tool for the assessment of cancer patients' needs. *Ecancermedicalscience*, 14. <https://doi.org/10.3332/ecancer.2020.1000>
- Bailo, L., Guidi, P., Vergani, L., Marton, G., & Pravettoni, G. (2019). The patient perspective: Investigating patient empowerment enablers and barriers within the oncological care process. *Ecancermedicalscience*, 13. <https://doi.org/10.3332/ecancer.2019.912>
- Bernstein, L. J., McCreath, G. A., Komeylian, Z., & Rich, J. B. (2017). Cognitive impairment in breast cancer survivors treated with chemotherapy depends on control group type and cognitive domains assessed: A multilevel meta-analysis. *Neuroscience and Biobehavioral Reviews*, 83, 417–428. Elsevier Ltd. <https://doi.org/10.1016/j.neubiorev.2017.10.028>
- Bernstein, L. J., McCreath, G. A., Nyhof-Young, J., Dissanayake, D., & Rich, J. B. (2018). A brief psychoeducational intervention improves memory contentment in breast cancer survivors with cognitive concerns: Results of a single-arm prospective study. *Supportive Care in Cancer*, 26(8), 2851–2859. <https://doi.org/10.1007/s00520-018-4135-z>
- Blanchard, C. M., Stein, K. D., Baker, F., Dent, M. F., Denniston, M. M., Courneya, K. S., & Nehl, E. (2004). Association between current lifestyle behaviors and health-related quality of life in breast, colorectal, and prostate cancer survivors. *Psychology & Health*, 19(1), 1–13. <https://doi.org/10.1080/08870440310001606507>
- Bluethmann, S. M., Mariotto, A. B., & Rowland, J. H. (2016). Anticipating the 'silver tsunami': Prevalence trajectories and co-morbidity burden among older cancer survivors in the United States. *Cancer Epidemiol Biomarkers and Prevention*, 25(2), 367–402. <https://doi.org/10.1146/annurev-immunol-032713-120240>
- Bou Khalil, R. (2020). "Emotional Chemobrain": A new concept for chemotherapy adverse drug effect? . *L'Encephale*, 46(5), 508–515. Advance online publication. <https://doi.org/10.1016/j.encep.2020.08.005>
- Brewer, G. A., Knight, J., Thaddeus Meeks, J., & Marsh, R. L. (2011). On the role of imagery in event-based prospective memory. *Consciousness and Cognition*, 20(3), 901–907. <https://doi.org/10.1016/j.concog.2011.02.015>
- Cameron, J., Worrall-Carter, L., Page, K., Riegel, B., Lo, S. K., & Stewart, S. (2010). Does cognitive impairment predict poor self-care in patients with heart failure? *European Journal of Heart Failure*, 12(5), 508–515. <https://doi.org/10.1093/eurjhf/hfq042>
- Capocaccia, R., Gatta, G., & Dal Maso, L. (2015). Life expectancy of colon, breast, and testicular cancer patients: An analysis of US-SEER population-based data. *Annals of Oncology*, 26(6), 1263–1268. <https://doi.org/10.1093/annonc/mdv131>
- Chao, H.H., Uchio, E., Zhang, S. et al. (2012). Effects of androgen deprivation on brain function in prostate cancer patients – a prospective observational cohort analysis. *BMC Cancer* 12, 371. <https://doi.org/10.1186/1471-2407-12-371>
- Chasteen, A. L., Park, D. C., & Schwarz, N. (2001). Implementation intentions and facilitation of prospective memory. *PSYCHOLOGICAL SCIENCE Research Article*, 12(6), 457–461. <https://doi.org/10.1111/1467-9280.00385>
- Chen, X., jie,, Wang, Y., Liu, L., lu,, Cui, J., fang,, Gan, M., yuan,, Shum, D. H. K., & Chan, R. C. K. (2015). The effect of implementation intention on prospective memory: A systematic and meta-analytic review. *Psychiatry Research*, 226(1), 14–22. <https://doi.org/10.1016/j.psychres.2015.01.011>
- Chen, X.-J., Wang, Y., Liu, -L.-L., Shi, H.-S., Wang, J., Cui, J.-F., ... Chan, R. C. K. (2014). The effect and mechanisms of implementation intentions on prospective memory in individuals with and without schizotypal personality features. *Memory (Hove, England)*, 22(4), 349–359. <https://doi.org/10.1080/09658211.2013.792841>
- Cheng, H., Yang, Z., Dong, B., Chen, C., Zhang, M., Huang, Z., ... Wang, K. (2013). Chemotherapy-induced prospective memory impairment in patients with breast cancer. *Psycho-Oncology*, 22(10), n/a-n/a. <https://doi.org/10.1002/pon.3291>
- Cheng, H., Yang, Z., Dong, B., Chen, C., Zhang, M., Huang, Z., Wang, K. (2013). Chemotherapy-induced prospective memory impairment in patients with breast cancer. *Psycho-Oncology*, 22, 2391–2395. <https://doi.org/10.1002/pon.3291>

- Cohen, A.-L., & Gollwitzer, P. M. (2008). *The cost of remembering to remember. Cognitive load and implementation intentions influence ongoing task performance*. Taylor & Francis Group/Lawrence Erlbaum Associates., Ed..
- Currie, K., Rideout, A., Lindsay, G., & Harkness, K. (2015). The association between mild cognitive impairment and self-care in adults with chronic heart failure. *The Journal of Cardiovascular Nursing*, 30(5), 382–393. <https://doi.org/10.1097/JCN.0000000000000173>
- Dagenais, E., Rouleau, I., Tremblay, A., Demers, M., Roger, É., Jobin, C., & Duquette, P. (2016). Prospective memory in multiple sclerosis: The impact of cue distinctiveness and executive functioning. *Brain and Cognition*, 109, 66–74. <https://doi.org/10.1016/j.bandc.2016.07.011>
- Demark-Wahnefried, W., Aziz, N. M., Rowland, J. H., & Pinto, B. M. (2005). Riding the crest of the teachable moment: promoting long-term health after the diagnosis of cancer. *Journal of Clinical Oncology*, 23(24), 5814–5830. <https://doi.org/10.1200/JCO.2005.01.230>
- Einstein, G. O., & McDaniel, M. A. (1990). Normal aging and prospective memory. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, 16 (4), 717–726. <https://doi.org/10.1037/0278-7393.16.4.717>
- Einstein, G. O., McDaniel, M. A., Richardson, S. L., Guynn, M. J., & Cunfer, A. R. (1995). Aging and prospective memory: Examining the influences of self-initiated retrieval processes. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, 21 (4), 996–1007. <https://doi.org/10.1037/0278-7393.21.4.996>
- Ferguson, R. J., Ahles, T. A., Saykin, A. J., McDonald, B. C., Furstenberg, C. T., Cole, B. F., & Mott, L. A. (2007). Cognitive-behavioral management of chemotherapy-related cognitive change. *Psycho-Oncology*, 16(8), 772–777. <https://doi.org/10.1002/pon.1133>
- Fish, J. E., Manly, T., Kopelman, M. D., & Morris, R. G. (2015). Errorless learning of prospective memory tasks: An experimental investigation in people with memory disorders. *Neuropsychological Rehabilitation*, 25(2), 159–188. <https://doi.org/10.1080/09602011.2014.921204>
- Foster, E. R., McDaniel, M. A., & Rendell, P. G. (2017). Improving prospective memory in persons with parkinson disease: a randomized controlled trial. *Neurorehabilitation and Neural Repair*, 31(5), 451–461. <https://doi.org/10.1177/1545968317690832>
- Gilardi, S., Guglielmetti, C., & Pravettoni, G. (2014). Interprofessional team dynamics and information flow management in emergency departments. *Journal of Advanced Nursing*, 70(6), 1299–1309. <https://doi.org/10.1111/jan.12284>
- Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. *European Review of Social Psychology*, 4 (1), 141–185. <https://doi.org/10.1080/14792779343000059>
- Gollwitzer, P. M. (1999). Implementation intentions strong effects of simple plans. *The American Psychologist*, 54(7), 493–503. KOPS. <https://pdfs.semanticscholar.org/4c21/6c0ceef2e2745d113c77a417133c2084dd9.pdf>
- Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: a meta-analysis of effects and processes. *Advances in Experimental Social Psychology*, 38, 69–119. [https://doi.org/10.1016/S0065-2601\(06\)38002-1](https://doi.org/10.1016/S0065-2601(06)38002-1)
- Gollwitzer, P. M., & Sheeran, P. (2009). Self-regulation of consumer decision making and behavior: The role of implementation intentions. *Journal of Consumer Psychology*, 19(4), 593–607. <https://doi.org/10.1016/j.jcps.2009.08.004>
- Graf, P. (2011). Special issue editorial: Prospective memory in 2010. *Canadian Journal of Experimental Psychology/Revue Canadienne De Psychologie Expérimentale*, 65(1), 1–2. <https://doi.org/10.1037/a0023182>
- Griffiths, A., Hill, R., Morgan, C., Rendell, P. G., Karimi, K., Wanagaratne, S., & Curran, H. V. (2012). Prospective memory and future event simulation in individuals with alcohol dependence. *Addiction*, 107(10), 1809–1816. <https://doi.org/10.1111/j.1360-0443.2012.03941.x>
- Grilli, M. D., & McFarland, C. P. (2011). Imagine that: Self-imagination improves prospective memory in memory-impaired individuals with neurological damage. *Neuropsychological Rehabilitation*, 21(6), 847–859. <https://doi.org/10.1080/09602011.2011.627263>
- Halvorsen, K., Dihle, A., Hansen, C., Nordhaug, M., Jerpseth, H., Tveiten, S., Joranger, P., & Ruud Knutsen, I. (2020). Empowerment in healthcare: A thematic synthesis and critical discussion of concept analyses of empowerment. *Patient Education and Counseling*, 103 (7), 1263–1271. Elsevier Ireland Ltd. <https://doi.org/10.1016/j.pec.2020.02.017>
- Hermansson, E., & Mårtensson, L. (2011). Empowerment in the midwifery context—a concept analysis. *Midwifery*, 27(6), 811–816. <https://doi.org/10.1016/j.midw.2010.08.005>
- Hermelink, K., Untch, M., Lux, M. P., Kreienberg, R., Beck, T., Bauerfeind, I., & Münzel, K. (2007). Cognitive function during neoadjuvant chemotherapy for breast cancer. *Cancer*, 109(9), 1905–1913. <https://doi.org/10.1002/cncr.22610>
- Hoffman, K. E., McCarthy, E. P., Recklitis, C. J., & Ng, A. K. (2009). Psychological distress in long-term survivors of adult-onset cancer. *Archives of Internal Medicine*, 169(14), 1274. <https://doi.org/10.1001/archin.termed.2009.179>
- Insel, K. C., Einstein, G. O., Morrow, D. G., Koerner, K. M., & Hepworth, J. T. (2016). Multifaceted prospective memory intervention to improve medication adherence. *Journal of the American Geriatrics Society*, 64(3), 561–568. <https://doi.org/10.1111/jgs.14032>
- Jim, H. S. L., Donovan, K. A., Small, B. J., Andrykowski, M. A., Munster, P. N., & Jacobsen, P. B. (2009). Cognitive functioning in breast cancer survivors: A controlled comparison. *Cancer*, 115(8), 1776–1783. <https://doi.org/10.1002/cncr.24192>
- Joly, F., Rigal, O., Noal, S., & Giffard, B. (2011). Cognitive dysfunction and cancer: Which consequences in terms of disease management? *Psycho-Oncology*, 20(12), 1251–1258. <https://doi.org/10.1002/pon.1903>
- Jones, W. E., Bengel, J. F., & Scullin, M. K. (2021). Preserving prospective memory in daily life: A systematic review and meta-analysis of mnemonic strategy, cognitive training, external memory aid, and combination interventions. *Neuropsychology*, 35 (1), 123–140. <https://doi.org/10.1037/neu0000704>
- Kardasmenos, K. S., Clawson, D. M., Wilken, J. A., & Wallin, M. T. (2008). Prospective memory and the efficacy of a memory strategy in multiple sclerosis. *Neuropsychology*, 22(6), 746–754. <https://doi.org/10.1037/a0013211>
- Kondylakis, H., Koumakis, L., Tsiknakis, M., Marias, K., Genitsaridi, E., Pravettoni, G., & Mazzocco, K. (2013). *Smart recommendation services in support of patient*

- empowerment and personalized medicine (pp. 39–61). Springer. https://doi.org/10.1007/978-3-319-00375-7_4
- Kretschmer, A., Altgassen, M., Rendell, P. G., & Bölte, S. (2014). Prospective memory in adults with high-functioning autism spectrum disorders: Exploring effects of implementation intentions and retrospective memory load. *Research in Developmental Disabilities*, 35(11), 3108–3118. <https://doi.org/10.1016/j.ridd.2014.07.052>
- Kuśmirek, M., Jasionowska, J., Maruszewska, P., Kalinka-Warzocho, E., Gałecski, P., Mikołajczyk, I., & Talarowska, M. (2020). The impact of cancer treatment on cognitive efficiency: Chemobrain – Does it exist? *European Journal of Psychiatry*, 34(1), 20–26. <https://doi.org/10.1016/j.ejpsy.2019.10.002>
- Li, W., Gan, C., Lv, Y., Wang, S., & Cheng, H. (2017). Chemotherapy-induced prospective memory impairment in breast cancer patients with different hormone receptor expression. *Medicine*, 96(13), e6514. <https://doi.org/10.1097/MD.00000000000006514>
- Li, Y., Schoufour, J., Wang, D. D., Dhana, K., Pan, A., Liu, X., Song, M., Liu, G., Shin, H. J., Sun, Q., Al-Shaar, L., Wang, M., Rimm, E. B., Hertzmark, E., Stampfer, M. J., Willett, W. C., Franco, O. H., & Hu, F. B. (2020). Healthy lifestyle and life expectancy free of cancer, cardiovascular disease, and type 2 diabetes: Prospective cohort study. *BMJ (Clinical research ed.)*, 368, l6669. <https://doi.org/10.1136/bmj.l6669>
- Liu, L., Wang, Y., Li, Y., Liu, -L.-L., Cui, J.-F., Yang, T.-X., Chen, T., Neumann, D. L., Shum, D. H., & Chan, R. C. (2020). The effect of implementation intentions on prospective memory performance in patients with schizophrenia: A multinomial modeling. *Schizophrenia Research*, 215, 120–125. <https://doi.org/10.1016/j.schres.2019.11.003>
- Liu, Y., Lv, Y., Gan, C., Chen, H., Chao, H. H., Li, C. R., & Chen, Z. (2018). Prospective memory and retrospective memory impairment in patients with nasopharyngeal carcinoma after radiotherapy. *International Journal of Clinical and Experimental Medicine*, 11(7), 7240–7246.
- Marton, G., Pizzoli, S. F. M., Vergani, L., Mazzocco, K., Monzani, D., Bailo, L., Pancani, L., & Pravettoni, G. (2020). Patients' health locus of control and preferences about the role that they want to play in the medical decision-making process. *Psychology, Health & Medicine*, 1–7. Advance online publication. <https://doi.org/10.1080/13548506.2020.1748211>
- McDaniel, M. A., Howard, D. C., & Butler, K. M. (2008). Implementation intentions facilitate prospective memory under high attention demands. *Memory & Cognition*, 36(4), 716–724. <https://doi.org/10.3758/MC.36.4.716>
- Erin L. McGowan, PhD, Scott North, MD, Kerry S. Courneya, Ph.D. (2013). Randomized controlled trial of a behavior change intervention to increase physical activity and quality of life in prostate cancer survivors. *Annals of Behavioral Medicine*, 46(3), 382–393. <https://doi.org/10.1007/s12160-013-9519-1>
- Monzani, D., Vergani, L., Pizzoli, S. F. M., Marton, G., Mazzocco, K., Bailo, L., ... Pravettoni, G. (2020). Sexism interacts with patient–physician gender concordance in influencing patient control preferences: findings from a vignette experimental design. *Applied Psychology. Health and Well-being*, 12(2), 471–492. <https://doi.org/10.1111/aphw.12193>
- Moor, J. S., De, Mariotto, A. B., Parry, C., Alfano, C. M., Padgett, L., Kent, E. E., ... Rowland, J. H. (2014). Cancer survivors in the United States: prevalence across the survivorship trajectory and implications for care. *Cancer Epidemiol Biomarkers and Prevention*, 22(4), 561–570. <https://doi.org/10.1158/1055-9965.EPI-12-1356>
- Cancer
- Ng, T., Teo, S. M., Yeo, H. L., Shwe, M., Gan, Y. X., Cheung, Y. T., ... Chan, A. (2016). Brain-derived neurotrophic factor genetic polymorphism (rs6265) is protective against chemotherapy-associated cognitive impairment in patients with early-stage breast cancer. *Neuro-Oncology*, 18(2), 244–251. <https://doi.org/10.1093/neuonc/nov162>
- Noal, S., Levy, C., Hardouin, A., Rieux, C., Heutte, N., Ségura, C., ... Joly, F. (2011). One-year longitudinal study of fatigue, cognitive functions, and quality of life after adjuvant radiotherapy for breast cancer. *International Journal of Radiation Oncology, Biology, Physics*, 81(3), 795–803. <https://doi.org/10.1016/j.ijrobp.2010.06.037>
- Okuda, J., Fujii, T., Ohtake, H., Tsukiura, T., Yamadori, A., Frith, C. D., & Burgess, P. W. (2007). Differential involvement of regions of rostral prefrontal cortex (Brodmann area 10) in time- and event-based prospective memory. *International Journal of Psychophysiology*, 64(3), 233–246. <https://doi.org/10.1016/j.ijpsycho.2006.09.009>
- Paquet, L., Collins, B., song, X., Chinneck, A., Bedard, M., & Verma, S. (2013). A pilot study of prospective memory functioning in early breast cancer survivors. *The Breast*, 22(4), 455–461. <https://doi.org/10.1016/j.breast.2013.04.002>
- Paquet, L., Verma, S., Collins, B., Chinneck, A., Bedard, M., & Song, X. (2018). Testing a novel account of the dissociation between self-reported memory problems and memory performance in chemotherapy-treated breast cancer survivors. *Psycho-Oncology*, 27(1), 171–177. <https://doi.org/10.1002/pon.4389>
- Phillips, J. L., & Currow, D. C. (2010). Cancer as a chronic disease. *Collegian (Royal College of Nursing, Australia)*, 17 (2), 47–50. <https://doi.org/10.1016/j.colegn.2010.04.007>
- Pizzoli, S. F. M., Renzi, C., Arnaboldi, P., Russell-Edu, W., & Pravettoni, G. (2019). From life-threatening to chronic disease: Is this the case of cancers? A systematic review. *Cogent Psychology*, 6(1), 1–17. <https://doi.org/10.1080/23311908.2019.1577593>
- Raskin, S. A. (2018). Prospective memory in clinical populations. *The Clinical Neuropsychologist*, 32(5), 741–747. <https://doi.org/10.1080/13854046.2018.1484519>
- Raskin, S. A., Smith, M. P., Mills, G., Pedro, C., & Zamroziewicz, M. (2019). Prospective memory intervention using visual imagery in individuals with brain injury. *Neuropsychological Rehabilitation*, 29(2), 289–304. <https://doi.org/10.1080/09602011.2017.1294082>
- Renzi, C., Riva, S., Masiero, M., & Pravettoni, G. (2016). The choice dilemma in chronic hematological conditions: Why choosing is not only a medical issue? A psycho-cognitive perspective. *Critical Reviews in Oncology/hematology*, 99, 134–140. <https://doi.org/10.1016/j.critrevonc.2015.12.010>
- Rey, D., Bouhnik, A.-D., Mancini, J., Bendiane, M.-K., Séror, V., & Viens, P. (2012). Self-reported cognitive impairment after breast cancer treatment in young women from the ELIPPSE40 cohort: The long-term impact of chemotherapy. *The Breast Journal*, 18(5), 406–414. <https://doi.org/10.1111/j.1524-4741.2012.01275.x>
- Richard, N. M., Bernstein, L. J., Mason, W. P., Laperriere, N., Maurice, C., Millar, B. A., ... Edelstein, K. (2019). Cognitive rehabilitation for executive dysfunction in brain tumor patients: a pilot randomized controlled trial. *Journal of Neuro-Oncology*, 142(3), 565–575. <https://doi.org/10.1007/s11060-019-03130-1>

- Rowland, J. H., & Yancik, R. (2006). Cancer survivorship: The interface of aging, comorbidity, and quality care. *Journal of the National Cancer Institute*, 98(8), 504–505. <https://doi.org/10.1093/jnci/djj154>
- Schnitzspahn, K. M., Zeintl, M., Jäger, T., & Kliegel, M. (2011). Metacognition in prospective memory: Are performance predictions accurate? *Canadian Journal of Experimental Psychology = Revue Canadienne De Psychologie Experimentale*, 65(1), 19–26. <https://doi.org/10.1037/a0022842>
- Smith, G., Del Sala, S., Logie, R. H., & Maylor, E. A. (2000). Prospective and retrospective memory in normal ageing and dementia: A questionnaire study. *Memory*, 8(5), 311–321. <https://doi.org/10.1080/09658210050117735>
- Su, Y., Pu, Y., Zhao, Z., & Yang, X. (2020). Influence of combined epidural anesthesia on cognitive function, inflammation and stress response in elderly liver cancer patients undergoing surgery. *Oncology Letters*, 19(4), 2733–2738. <https://doi.org/10.3892/ol.2020.11395>
- Terry, W. S. (1988). Everyday forgetting: data from a diary study. *Psychological Reports*, 62(1), 299–303. <https://doi.org/10.2466/pr0.1988.62.1.299>
- Vardy, J. (2009). Cognitive function in breast cancer survivors. *Cancer Treatment and Research*, 151, 387–419. https://doi.org/10.1007/978-0-387-75115-3_24
- Weaver, K. E., Foraker, R. E., Alfano, C. M., Rowland, J. H., Arora, N. K., Bellizzi, K. M., ... Aziz, N. M. (2013). Cardiovascular risk factors among long-term survivors of breast, prostate, colorectal, and gynecologic cancers: A gap in survivorship care? *Journal of Cancer Survivorship*, 7(2), 253–261. <https://doi.org/10.1007/s11764-013-0267-9>
- Wefel, J. S., Vardy, J., Ahles, T., & Schagen, S. B. (2011). International cognition and cancer task force recommendations to harmonise studies of cognitive function in patients with cancer. *The Lancet Oncology*, 12(7), 703–708. [https://doi.org/10.1016/S1470-2045\(10\)70294-1](https://doi.org/10.1016/S1470-2045(10)70294-1)
- Winograd, E. (1988). Some observations on prospective remembering. In M. M. Gruneberg, P. E. Morris, & R. N. Sykes (Eds.), *Practical aspects of memory: Current research and issues*, Vol. 1. *Memory in everyday life* (p. 348–353). John Wiley & Sons..
- World Health Organisation (WHO). (2005). Preventing Chronic Diseases: A Vital Investment. *Preventing chronic disease a vital investment*. https://www.who.int/chp/chronic_disease_report/full_report.pdf
- Yang, J., Zhong, F., Qiu, J., Cheng, H., & Wang, K. (2015). Dissociation of event-based prospective memory and time-based prospective memory in patients with prostate cancer receiving androgen-deprivation therapy: A neuropsychological study. *European Journal of Cancer Care*, 24(2), 198–204. <https://doi.org/10.1111/ecc.12299>
- Yao, C., Bernstein, L. J., & Rich, J. B. (2017). Executive functioning impairment in women treated with chemotherapy for breast cancer: A systematic review. *Breast Cancer Research and Treatment*, 166(1), 15–28. Springer New York LLC. <https://doi.org/10.1007/s10549-017-4376-4>
- Zeintl, M., Kliegel, M., Rast, P., & Zimprich, D. (2006). Prospective memory complaints can be predicted by prospective memory performance in older adults. *Dementia and Geriatric Cognitive Disorders*, 22(3), 209–215. <https://doi.org/10.1159/000094915>
- Zeng, Y., Dong, J., Huang, M., Zhang, J. E., Zhang, X., Xie, M., & Wefel, J. S. (2020). Nonpharmacological interventions for cancer-related cognitive impairment in adult cancer patients: A network meta-analysis. *International Journal of Nursing Studies*, 104, 103514. <https://doi.org/10.1016/j.ijnurstu.2019.103514>
- Zimmermann, T. D., & Meier, B. (2009). The effect of implementation intentions on prospective memory performance across the lifespan. *Applied Cognitive Psychology*, 24(5), 645–658. <https://doi.org/10.1002/acp.1576>
- Zuber, S., & Kliegel, M. (2020). Prospective memory development across the lifespan: An integrative framework.



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