GAIN – Get going After concussIoN

Early intervention for persisting post-concussion symptoms

Main manual

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Content

Overview of tools and work papers

All worksheets (marked in green and labelled A-G) are a mandatory part of GAIN and are applied in all individual sessions.
The tools (marked in red and named numerically 1-16) are either
1) models that will be presented in the psychoeducation (tools 1-8), or
2) guidance targeting specific symptoms (tools 9-16).

While all patients will be presented with the models (tools 1-8), not all patients will be presented with guidance targeting specific symptoms (tools 9-16). This will be elaborated in the GAIN manual. All tools may be applied as needed in the individual sessions.

Working papers (mandatory in all courses)
A. Activity questionnaire
B. Goal ladder
C. BORG scale
D. Weekly plan
E. Status at the last individual meeting
F. Three things I will remember
G. Future goals

Models (from training, include as needed)
Tool 1. The bio-psycho-social illness model
Tool 2. Boom and bust model
Tool 3. The zones of safety, development, and overload.
Tool 4. Staircase-model
Tool 5. Stress/resources model
Tool 6. Lifeline model
Tool 7. Barriers
Tool 8. Vicious circle

Symptom-specific guides (included as needed)
Tool 9. Ergonomics and work habits
Tool 10. Exercise for neck and shoulders
Tool 11. Guidance and exercise for dizziness
Tool 12. Sleep hygiene
Tool 13. Breathing exercise
Tool 14. Use of painkillers
Tool 15. The pyramid of cognition
Tool 16. The memory process

Chapter 1. Introduction: basic principles and methods of GAIN

The bio-psycho-social model and treatment principles

GAIN is based on a bio-psycho-social understanding of the development and management of persisting post-concussion symptoms (PPCS). That is, an assumption that there are always many different factors that affect people's level of functioning and that may contribute to maintaining/prolonging post-concussion symptoms (Figure 1). Some factors are modifiable, some are not. GAIN focuses on the factors that the patient can actively do something to modify.

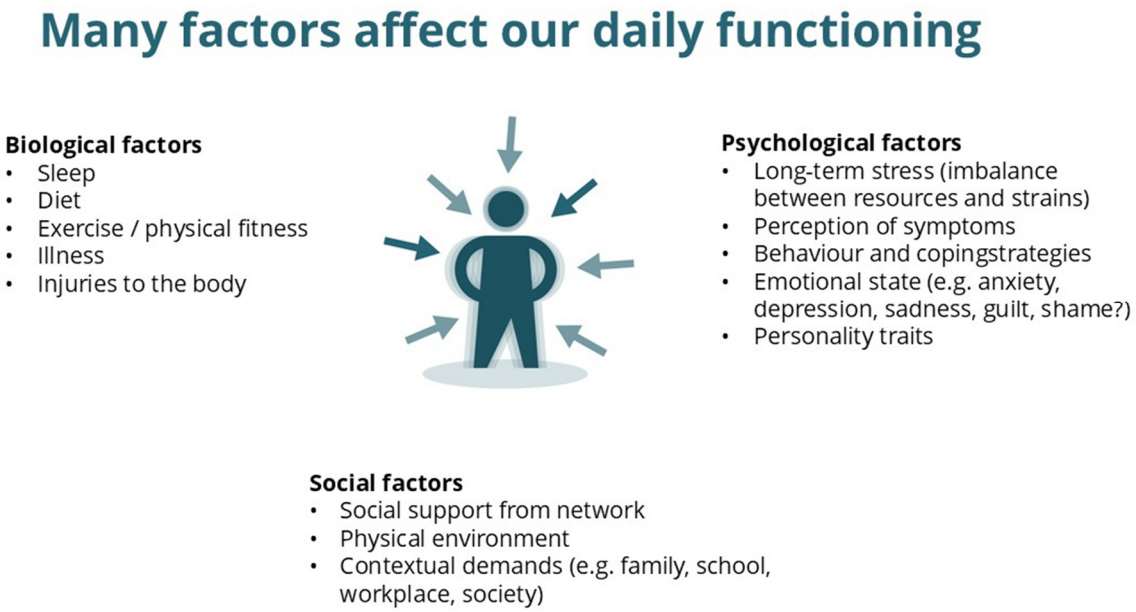


Figure 1: The bio-psycho-social understanding of PPCS. The model illustrates that there are always many factors affecting a person's level of functioning and the outcome after a concussion. This figure is the same as tool 1 in the GAIN materials: "the bio-psycho-socal illness model".

GAIN is an 8-week counselling and training program based on

1) Principles from **Acceptance and Commitment Therapy** (ACT for short), a third-wave cognitive behavioural therapy. The basic assumption is that there is a close relationship between thoughts, feelings and behaviour;

and

2) gradual return to activities

The principle of graduated return to activity is based on **graded exercise therapy** and is a method of gradually increasing either the intensity or the duration of activities in everyday life from an appropriate starting point.

GAIN uses a **broad concept of activity** that corresponds to the occupational therapy concept of Activities of Daily Living (ADL). Activities include not only physical activity, but also personal care, work activities, social activities, cultural activities and leisure activities.

In GAIN, a slight worsening of symptoms during and after activities is acceptable (as opposed to an approach where the patient is advised to always stay below the symptom threshold in activities). As a rule of thumb, symptom worsening should not persist the following day.

Focus on the patient's illness perception and illness behaviour

The therapist's role in GAIN goes beyond the traditional therapist role, where the therapist is generally the 'expert' and the patient the more passive recipient of treatment and counselling. The therapist should strive to promote collaboration between the therapist and the patient where the patient is made co-responsible for the process and their own recovery process. The patient is the expert on their own life and how they experience their symptoms. The therapist is an expert on concussion and adaptive management of post-concussion symptoms.

It is a basic premise in GAIN that it is necessary for the therapist to investigate and to understand how the patient experiences and understands the concussion and his or her symptoms. This may be described as the patient's **illness perception** and can be investigated by the following questions (see also **appendix B, example 1**):

- What does the patient think the symptoms signal / mean?
- What consequences does the patient think the symptoms will have?
- What do the patient believe are the causes of the symptoms? Is the focus solely on the concussion itself or is there a more nuanced understanding of the causes?
- How long do the patient think the symptoms will last?
- Does the patient believe that treatment/counselling will help and that he/she can actively do something to reduce symptoms and improve his or her level of function in everyday life?

It is also important for the therapist to understand how the patient copes with their symptoms, which may be described as the patient's **illness behaviour.** Illness behaviour is closely related to concepts such as *coping* or *coping strategies*.

The counselling in GAIN must be based on the patient's illness perception and illness behavior. It is therefore an important prerequisite for the GAIN program that the therapist focuses on exploring this.

The relationship between therapist and patient

The relationship between therapist and patient is crucial for the patient's motivation and recovery process. The therapist must work to achieve a relationship with the patient that is based on co-operation and empathy. Communication between therapist and patient is important, and the therapist should apply some general communication techniques (described under **"Level 1" in chapter 2**).
The patient should feel heard and understood by the therapist recognising the patient's symptoms and problems as real and difficult to manage. The therapist should strive to meet the patient with curiosity and a desire to understand, rather than with doubt and scepticism. This is a prerequisite for the patient to trust the therapist and to be open to a more nuanced understanding of their symptoms and challenges. A good "chemistry" and collaboration between therapist and patient also promotes the patient's positive expectations of the GAIN program, which is always important for treatment effect, regardless of the disease or disorder in question.
The goal is for the patient to gradually become a increasingly active participant in the process as the patient's **empowerment** increases (i.e. the patient's strength and belief in being able to take action and create a desired change themselves).

Individual goal setting

In GAIN the intervention is adapted to the patient's specific challenges, goals and needs.

At the beginning of the program, specific goals are identified that the patient wants to work towards. The patient is actively involved in this process of defining goals that are meaningful to them. The goals should be formulated as **specific activities** that the patient would like to be able to perform better again or perform as before the concussion (cf. the broad concept of activity) and not formulated as a goal to reduce specific symptoms.

During the process, the patient is also actively involved in defining what steps he/she is able and willing to take to move in the desired direction.

Choose no more than 2-3 activity-based goals
The assumption is that if the patient works towards one activity-based goal, it will have a positive effect on other activities and the general symptom level Therefore, it is not important which activity based goals the patient chooses, as long as the activities are important and motivating to them.

It is important that the therapist does not get carried away by a patient who wants to "get better at everything" but instead supports the patient in prioritising goals.

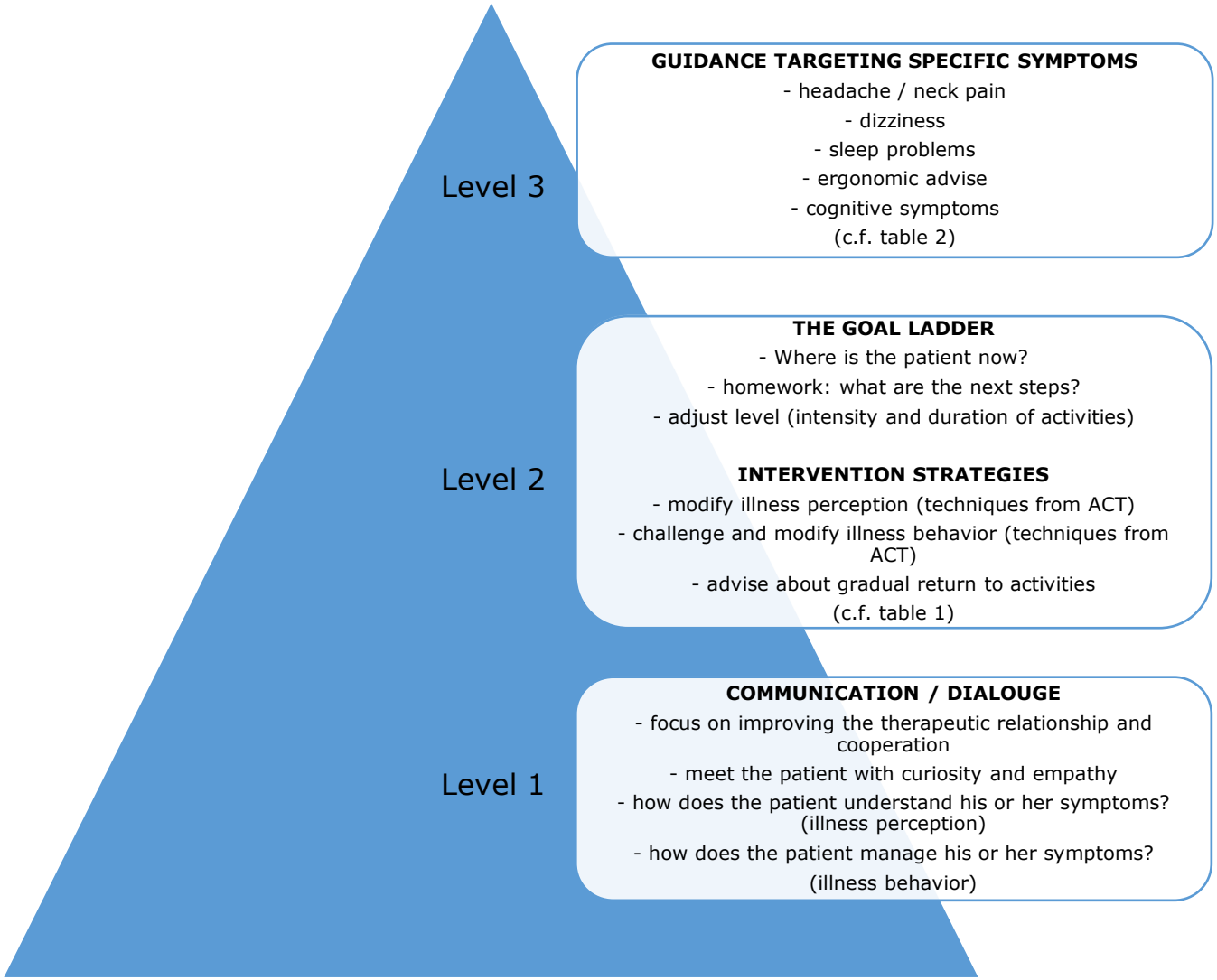
For example: if a patient with low activity levels due to headaches gradually becomes more physically active (e.g. daily walks), it will have a positive effect on their level of functioning in other areas and overall symptom levels.

Physical activity
At least one goal must involve physical activity. This is based on evidence that graded physical exercise is effective in preventing and treating long-term symptoms after concussion. Many patients need help to gradually get started with exercise/physically demanding activities, but there are also some who need support to reduce the amount or intensity of exercise/physical activity in daily life as part of energy management and to achieve a better balance between resources and strain.

Chapter 2. The levels in GAIN

In this chapter, GAIN is presented in terms of a three-level structure. See **figure 2** for an overview.
In all counselling sessions, the therapist starts at **Level 1** and only then moves to **Level 2**. In some counselling sessions, the therapist will also move up to **Level 3** depending on the patient's individual goals and needs.

Figure 2: The three levels of GAIN



Level 1: Communication and dialogue

The most important part of GAIN is communication between the therapist and the patient[1]

The therapist may apply the general communication strategies described in **Box 1**. In general, open-ended questions should be emphasised and the therapist should strive to explore the patient's perspective and understanding.

The aim is to understand the patient's current situation, challenges, illness perception and illness behaviour. The therapist may apply the questions in **Appendix B, example 1.**

While the therapist explores the patient's illness perception and illness behaviour, he/she should try to remain neutral and refrain from correcting the patient or offering alternative explanations and premature advice. The important thing here is how the patient perceives things, not how the therapist thinks things are connected. As a therapist, you should be careful not to give up too quickly or jump to conclusions about the patient. Even if you don't understand the patient, get annoyed with the patient, or if what the patient says sounds strange from a professional point of view. The patient should be met with curiosity and empathy rather than skepticism.

The dialogue can be described as a "joint journey of discovery", where the therapist and the patient through dialogue both learn more about the patient's challenges and what the patient can do to enhance the recovery process.

At the beginning of the process, the therapist may be relatively active in guiding the dialogue, but the goal is that the patient becomes more and more active during the process, for example in relation to formulating their homework.
In the first individual sessions, it will often be necessary to spend a lot of time on level 1, but in subsequent sessions you will gradually spend more time on level 2.

[1] The way in which the therapist should aim to communicate with the patient focuses on empowering the patient and motivating behavioural change. It is comparable to the concept of "Motivational Interviewing", which many healthcare professionals will already be familiar with. See fx. Miller, W. R., & Rollnick, S. (2013). Motivational interviewing: Helping people change (3rd edition). *The Guilford Press.*

Box 1. General communication techniques

Socratic questioning technique
Be curious about how people think, feel and perceive their situation.

Whenever possible, ask open-ended questions such as *"What happened when you ....." "What did you think about it?" "How do you feel about ...?".*

Socratic dialogue promotes the "shared journey of discovery" for therapist and patient. They should both become wiser along the way.

Summaries
Summaries can help ensure that the patient feels heard and understood and that the therapist has understood the patient correctly.

Also, people hear things differently when what they say is reproduced by others.

Use phrases like:
*"You say that..." (*either repeat what the patient says verbatim; rephrase by using other words with the same meaning)

In some cases, you may try to make an interpretation of what the patient is saying, presented as a question, e.g. *"You say you get frustrated, could it be that you also get upset?".*

"Do I understand you correctly when I hear that ...."

Empathy:
Provide feedback on the emotions the patient communicates either verbally or non-verbally (e.g. does the patient look tense, does the patient become quiet, does eye contact disappear?)
Use phrases such as:
"I can tell by looking at you that you have/had a bad time with..."
"I understand that it's uncomfortable for you when..."
"I can hear it's been difficult for you."

Level 2: Working with the goal ladder and gradual return to activities

At this level, the therapist utilises all the general intervention strategies in GAIN when working specifically with the patient's goals and homework. At the first individual session (on the same day as the 2nd group session), the goal ladder work begins when overall goals are formulated. As the programme progresses, most of the conversation will take place at level 2 around the goal ladder and graduated return to activity.

At each session, the therapist should ask about **how things have been since the last session**: How has the patient challenged him- or herself? What barriers (physical, mental, emotional, social) did he or she encounter when doing the homework? How did he or she deal with them? Here, the therapist can obtain important information about the patient's illness behaviour, including maladaptive illness behaviours such as fear-avoidance (i.e. the tendency to avoid activities that provoke symptoms out of fear that it might make things worse). The patient's illness behaviour can either enhance the recovery process or prolong the recovery process **(c.f. box 2)**.

Box 2. What happens in the brain after a concussion?

When you hit your head hard, there will be a diffuse acute impact on the brain, not just a local impact where the blow hits. Observation for the first 24 hours after a head trauma is recommended to ensure that no further complications such as a hemorrhage develop during the first 24 hours .

Changes in brain tissue are typically not visible on standard MRI and CT scans after a concussion. If these scans show small hemorrhages in the brain tissue, it may indicate a greater impact on the brain tissue, which in Denmark is often referred to as a brain contusion rather than a concussion. There is no consensus in clinical practice in Denmark on the diagnostic criteria for concussion. Also, no diagnostic test or biomarker can differentiate between a concussion (the mildest of head traumas) and a more severe traumatic brain injury. Traumatic brain injuries occurs at a continuum.

Based on what we now know from research using more advanced brain scans, it appears that the application of force can cause temporary minor changes in the brain tissue. These changes are interpreted as disruptions in the brain's chemical processes or microscopic damage to brain tissue that seem to normalise or heal within a few weeks or a few months, just as other minor injuries to the body's tissue would (e.g. a ruptured fibre in a calf muscle).
It is thought that the symptoms people experience in the immediate aftermath of a concussion are related to normal healing processes after the impact. The healing processes probably cause some form of temporary irritation in the brain (inflammatory processes), which is part of the natural repair processes. This irritation is likely to affect brain function in the weeks following the injury. However, studies do not show a clear correlation between the changes sometimes seen on the more advanced scans and the severity of post-concussion symptoms.

For some, brain function normalises within days of concussion, for others it takes longer. Several scanning studies suggest that the healing processes can take up to a few months after the concussion.

When a few months have passed since the concussion, it is less likely that it is exclusively the blow to the head that explain persistent symptoms. Research suggests that may be multiple causes to persisting post-concussion symptoms. There is overall consensus that persisting symptoms should be understood in terms of a bio-psycho-social model, where many factors interact to prevent a patient from returning to their previous level of function within a few weeks or months.

The evidence suggests that an active approach to challenging yourself physically, mentally and socially can be beneficial for the healing process, and thus for reducing symptoms and increasing everyday function after concussion. The brain is a plastic organ, which means it needs to be stimulated and challenged to maintain its functions. If cognitive and physical functions are not maintained for a longer period, the ability to use them may be temporarily impaired.

It is important to remember that the long-term changes seen in the brain after concussion in some brain scan studies are not specific to concussion. The same type of changes can be seen in patients with depression or long-term stress and other conditions that affect our behaviour for a period of time. Just as the structure and function of the brain affects our behaviour, our behaviour also affects the structure and function of the brain.

An active approach to rehabilitation is not only beneficial for concussion patients. For example, it is known that physical exercise can improve depression and reduce the risk of relapse, and that physical exercise for patients with chronic pain can reduce pain and increase their physical functioning.

Before finishing each session, make sure you **plan homework for the next week**: Where is the patient on the goal ladder? What is the next step? Should the duration and intensity of activities be increased or decreased? Does the patient want to adjust or change the goals? The goal ladder is a dynamic model that can be adapted during the process.

How and when are the general intervention strategies in GAIN applied in the goal ladder work?
Table 1 provides an overview of general intervention strategies in GAIN. Examples are given of how the therapist can apply strategies from cognitive behavioural therapy (more specifically: Acceptance and Commitment Therapy) and graduated return to activity (see Table 1, column "Intervention strategies"), based on what the patient presents (see Table 1, column "Focus for intervention"). The content of Table 1 is elaborated below.

The therapist enhances the recovery process
The therapist should strive to initiate and/or enhance a recovery process and to support the patient in overcoming the barriers they encounter when working towards their goals and returning to their usual activity level (or an adapted activity level if the patient wishes[2]). This is done by

- nuancing *the patient's understanding of their symptoms (illness perception)* based on the bio-psycho-social model (see **Appendix B, example 2**), with a particular focus on reducing catastrophic thinking about symptoms and avoidance behaviour, but without neglecting or trivialise the symptoms;

- supporting the patient in *managing symptoms more adaptively* in everyday life by changing behavior and habits;

- supporting the patient in a *gradual return to meaningful activities of daily living*, with a special focus on the patient's specific activity based goals;

- strengthening the patient's *empowerment* (the belief that they can actively do something to get better, and to change their situation);

- Reinforcing *positive expectations* for the recovery process.

The patient must be supported in reflecting on challenges, barriers and possible modifications of behaviour and habits that may promote the recovery process.

[2] During the process, some patients realise that they have been overloaded for a long time before the concussion, and/or not living a life in accordance with their values. These patients may not want to return to the same level of activity as before.

Maladaptive illness perceptions
Sometimes the patient seem to be stuck in an understanding that there is a direct causal relationship between the concussion and the symptoms and their situation. In other words: an understanding that the symptoms and their situation aredue to the concussion only. It is important not to get into a discussion with the patient about who is "right". As a therapist, you can try to shift the focus to what the patient can still do to get better, even if you do not have a common illness perception. See **Appendix B, example 3**

Challenging the patient at the right level
A key focus is whether the patient is challenging him- or herself at an appropriate level or whether he or she needs help and support to increase, reduce or even-out the daily activity level. The therapist supports the patient to **avoid excessive inactivity, persistent overload or the "boom-and-bust" pattern**[3] ".
Based on the patient's subjective experience of the effect different activities have on symptoms and functional level, both immediately after the activity and the following day(s), the intensity and duration of activities are adjusted for the next week. Short-term worsening of symptoms is accepted in GAIN, but any worsening of symptoms should subside by the next day at the latest. Otherwise, the intensity and duration of activity should be reduced next time.

The therapist should support the patient in reducing maladaptive avoidance behaviour and in exposing him/herself to activities and stimuli
After a concussion, it is common to react with so-called **avoidance behaviour** (also known as **fear-avoidance)**, where you interpret worsening symptoms, and thus the activities that provoke or aggravate symptoms, as something you should avoid. Often there will be a fear that this could worsen the condition, for example worsen a suspected injury to the brain. **Catastrophising thoughts** may arise around the symptoms, i.e. highly exaggerated thoughts about how dangerous the symptoms and thus the symptom-provoking activities may be. In these cases, the patient will be very careful to avoid activities that could potentially overload or overstimulate them. In some patients, symptoms may provoke **anxiety reactions**, such as sudden dizziness, palpitations, sweating, shortness of breath or visual disturbances. The patient may not recognise these as anxiety symptoms, and since the symptoms overlap with concussion symptoms, it may be impossible to distinguish between anxiety and post-concussion symptoms.

[3] Boom-and-bust behaviour is an irregular pattern of rest and activity where on days when symptoms are low and you feel reasonably well, you are very active (boom). The next day or the following days, you may suddenly feel tired and overwhelmed by symptoms, or perhaps completely unable to function (bust). Some people refer to this as a 'relapse'. If the patient has fallen into a boom-and-bust pattern that has been going on for a long time it may prevent recovery.

Avoidance is a natural response to discomfort. Avoidance behaviour is also common in people with chronic pain (whiplash, back pain, etc.) and has been associated with persistent symptoms and reduced function.

For people with concussion, avoidance behavior will often include avoidance of physically demanding activities; activities and situations where you are exposed to many stimuli (especially light and sound); and cognitively/mentally demanding activities. The latter are typically avoided due to fear that they may cause headaches and are sometimes referred to in literature as **"cogniphobia".** Avoidance of activities may cause the individual to develop increased sensitivity / hypersensitivity over time to certain activities and common stimuli such as light and sound. GAIN is based on the assumption that this sensitisation process can be compared to the central sensitisation processes that are thought to contribute to chronic pain conditions.

In GAIN, avoidance behaviour is managed through graduated return to the activities that provoke symptoms (may also be described as **graduated exposure**). The idea behind exposure is that the patient provokes the symptoms by exposing themselves to the activity, and then the patient should experience that the symptoms gradually disappear or diminish. It may be articulated to the patient that the body and brain must "learn" that these are not dangerous activities. The patient should endeavor to challenge themselves at the level they can tolerate and only gradually increase the intensity and duration of ativities from there. See also **Appendix B, example 4**.

Be aware of control behaviour
GAIN is based on principles from ACT therapy, including the importance of recognising inappropriate control strategies. **Control behaviours** or **control strategies** can be described as anything a patient does to avoid or get rid of negative or unpleasant thoughts and feelings. This can be anything from watching Netflix to eating chocolate if these are strategies that make the patient experience more positive emotions. Control strategies are not always maladaptive behaviours. However, if the individual uses them excessively, it can ultimately prevent them from living the life they want - or in this case, achieving the goals they set for their GAIN programme.

Examples may be
- to distract yourself from unpleasant thoughts by watching series on Netflix, running 10 kilometres every day or working (too) much;
- to stay away from places or people that cause discomfort;
- to use cognitive strategies such as "it's ok that I lie in bed when I have a headache - my brain needs rest after the concussion," or "it's my employer's fault that I'm not well yet, because she thought I should start work";
- to sleep an excessive number of hours;
- to take more painkillers;

- to get a massage to get rid of symptoms

There is an overlap between avoidance behaviour and control behaviour, sometimes it can be difficult to distinguish between them. The important thing is to recognise if the patient is overusing certain strategies to avoid experiencing unpleasant thoughts, feelings or bodily sensations. If so, the therapist can work with the patient to see how these strategies work for them, both in the short term and in the long term. Many of these strategies will relieve/remove the discomfort in the short term, but in the long term will not bring the patient closer to the life they want to live and the goals they have set for themselves. For example, many people will find that lying down with their eyes closed provides immediate relief from headaches. However, the effect is often short-lived, and in the long run it can be a bad strategy that makes headaches worse.

As shown in table 1, you can use **tool 6** and **tool 7** to visualise the problem with control and avoidance strategies for the patient.

Table 1: Overview of general intervention strategies in GAIN – sammenlign med tabellen fra feasibilityartiklen og ret formuleringer + ret navne på tools

Focus of intervention	Examples	Intervention strategies	Treatment material (appendix no.)
Maladaptive, symptomperpetuating illness perception	**Conviction that the symptoms** **- cannot be influenced** **- is caused by the concussion alone** **- is a sign of permanent brain damage and will persist**	**Education / dialogue** - Information about concussion and post-concussion symptoms as part of the normal recovery process (reassurance) - Persistent post-concussion symptoms are explained by the bio-psycho-social model of disease: many factors play	Bio-psycho-social disease model (tool 1)
		Techniques from acceptance and commitment therapy - Identify individual valuable goals - Focus on individual goals, actions and activities instead of symptoms - Create distance from thoughts (thoughts≠ reality), e.g. by catastrophic thoughts - explore the link between thoughts and behaviour, including identifying control and avoidance behaviours	The lifeline (tool 6) Obstacles (tool 7) Negative spiral (tool 8)
Inappropriate disease behaviour (continued next page)	**Excessive rest / inactivity** **Continuous overloading** **"Upswing - downswing pattern"**	**Education / dialogue** - the negative effect of excessive rest, constant overload, and "up-down" patterns	Upswing-Downswing pattern (Tool 2) Load zones (tool 3) The stair figure (tool 4) Requirements-resources seesaw (tool 5)

		"General" health behaviour (general for all people): Energy management / balance between activity and rest (at home, at school, at work, at leisure) - increase or decrease daily activity level - Manage and prioritise energy and resources (remember to prioritise pleasurable activities too) - Even out activity levels over days/weeks, e.g. by scheduling activities	
		General rehabilitation (for de-conditioning or lower activity levels than usual): Gradual return to regular activities - Gradually increase the duration or intensity of activities from a level that does not, or only briefly, aggravate post-concussion symptoms - Avoid large fluctuations in activity levels - Use a goal ladder to work incrementally towards individual, valuable goals	
	Avoidance behaviour (fear-avoidance)	**Challenge avoidance behaviour (in patients with anxiety/worry)** - recognise that the symptoms are uncomfortable but harmless (reassure) - talk about the effects of avoidance behaviour in the short term (relieves) and in the long term (worsens) - Exploring the connection between thoughts and behaviour, creating distance from thoughts - Exposure exercises: (gradual) exposure to activities, actions, stimuli that provoke symptoms to increase tolerance, possibly	The lifeline (tool 6) Obstacles (tool 7) Negative thought spiral (tool 8)

		gradual reduction of assistive devices (sunglasses, earplugs, etc.).	

Level 3: Interventions targeting single symptoms

While strategies from level 1 and 2 of GAIN should be applied in all sessions, strategies from level 3 should only be applied if the patient is particularly troubled by certain symptoms and ask for more specific training or advise. Here, the therapist can choose to use more targeted interventions that can support the patient to manage these symptoms more adaptively or attack these symptoms more directly. These intervention strategies are shown in **Table 2** (next page)**.**

Regardless of which symptom(s) the patient presents, GAIN is always based on the bio-psycho-social understanding of PPCS and the general strategies from Levels 1 and 2. That is, a broad approach to / a multifactorial understanding of the different (and complex) causes of the symptom(s). The therapist must therefore always be curious and investigative about the different factors that may perpetuate the symptoms.

Example: When complaining about headaches, the starting point is always to enhance a multifactorial understanding of the headache and address adaptive behavioural management of the headache (strategies from table 1) before resorting to specific neck exercises (strategies from table 2).

See also **Appendix B, example 6.**

Table 2: Overview of guidance for specific symptoms – sammenign med table fra feasibility og fra fidelity tabel

Focus for intervention	How-to guide [1]	Treatment material (appendix no.)
Work ergonomics	Recommend the individual to assess whether their workplace is set up correctly. Specific advice on ergonomics and work habits can be provided.	Ergonomics and work habits guide (tool 9)
Headaches	If tension headaches are suspected: If the patient is motivated for specific exercises, guidance can be given on training with elastic bands. If medication-induced headaches are suspected: offer standard counselling and refer to GP for regulation/change of medication. If severe migraines are suspected: consider a recommendation to consult your GP for possible medical treatment.	Elastic exercises for neck and shoulders (tool 10) Standard guidance on the medical management of post-concussion headache (tool 14)
Dizziness	If the patient is motivated for specific exposure exercises, these can be guided.	Dizziness and exposure exercise guide (tool 11)
Sleep advice	Specific advice on good sleep habits can be provided. Remember special attention to overload and stress and related intervention strategies. If low physical activity level: advise on the beneficial effects of exercise on natural fatigue and sleep	Sleep habits guide (tool 12) Breathing exercise (tool 13)
Cognitive symptoms (e.g. reduced concentration, memory, overview)	Normalise the experience of cognitive difficulties. Teaching about the relationship between cognitive functions based on the cognitive pyramid (e.g. how fatigue will lead to attention problems, which in turn will lead to impaired memory and/or overview; fatigue can lead to word finding difficulties). Suggest compensation strategies for memory loss (calendar, alarms etc.)	The cognitive pyramid (tool 15) The memory process (tool 16)

[1] Note: Always start with the bio-psycho-social understanding of the individual symptoms (there can be many causes), as well as the general intervention strategies (Table 1), including advice on graduated physical activity, before working more directly with individual symptoms/conditions.

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Appendix A. The structure of individual sessions

Tables A and B show a template for the structure of individual sessions. Below, the framework, purpose and content of the first individual conversation is described in a little more detail.

Framework for the first individual conversation

- The session takes place immediately before or after the second group session. It is scheduled with the patient at the first group meeting.
- Relatives can participate in this first individual session if the patient wishes.
- The duration is 30-40 minutes. However, 45 minutes are set aside for each patient to have "buffer" time between sessions.
- The "Activity Questionnaire" (Appendix A) must be completed as homework. (If it is not completed, the therapist goes through the questionnaire with the patient at the first session).

Purpose of the first individual session

- To initiate contact and start building a therapeutic alliance with the patient.
- To explore the patient’s limitations in everyday activities, and to explore which activities are most important to the patient (based on the "Activity Questionnaire").
- To evaluate the patient's baseline level of physical activity (based on the BORG-scale homework).
- To identify two activity-based goals for the GAIN program, at least one should be a physical activity. The activities are put at the top of the goal ladder. Formulate 1-2 "first steps" towards the goals (first step on the goal ladder), this will be the patient’s homework for next session.

Content of the first individual conversation

Table A shows a template for the first individual dialogue. The therapist may also be aware of the following:

- The therapist will have some information from the clinical assessment about the concussion and the patient's symptoms and situation. The therapist may briefly summarise this information and the patient may confirm and supplement the information.
- The therapist may ask about the patient's expectations of the GAIN program, and the patient's understanding of his / her symptoms and situation (i.e. information about the patient's illness perception).
- The therapist agree with the patient if the following sessions should be physical attendance or video consultations, and if possible agree about a fixed time.

Table A: Template for first initial conversation

	Focus	**Content**
1	Present the purpose of the meeting ("agenda") and define the framework	*We have a maximum of 30 minutes for our session today. We should* *- review your activity questionnaire* *- evaluate the exercise for the BORG form* *- identify two activity-based goals* *- plan homework: first step(s) towards your goals*
2	Review the "Activity Questionnaire" **(Working paper A)**	The "Activity Questionnaire" **(Worksheet A)** is reviewed with a focus on identifying two important and meaningful activities for the goal ladder.
3	Review the homework assignment from the BORG form **(Working paper C)**	Dialogue about physical activity and the overall activity level - should it be increased or decreased? Ask reflective and open questions, e.g: *- What do you think is the reason why it is difficult for you to perform "x" (the specific activity)*? (Illness perception). *- Try to describe what happens when you try to do x?* (Barriers?) *- What do you do if you meet barriers?* (Control / avoidance behaviours?)
4	Goal Ladder **(See Appendix B)**	Identify two activity-based goals and put them down at the top of the Goal Ladder (at least one goal must involve physical activity). If time is too short, start with one goal. Goals should aim to be SMART (Specific, Measurable, Achievable, Acceptable, Realistic and Timed). However, this can be difficult in practice.
5	Formulate home task(s): first step(s) on the Goal Ladder **(See Appendix B)**	Identify 1-3 activities or habit/behaviour changes that the patient will work on at

		home during the following week that directly or indirectly relate to the overall goals. As a minimum, one of the home tasks should involve physical activity. You may put this down on the first step of the Goal Ladder **(Working paper B)**. You may also put it down on a weekly plan **(Working paper D)** (when should the patient do the planned tasks?) or in the patient's own calendar, for example in a smartphone.
6	Brief summary	The therapist briefly summarises which overall activity goals the patient has chosen, as well as what sub-goals the patient has chosen in terms of activities/"first steps" to try out next time.
7	Schedule the next meeting and, if possible, the following individual sessions.	When and how (physical attendance or video consultation)? If the patient prefers video consultation, send an email with a link to the virtual meeting room and instructions. **Important: exchange contact information (phone numbers and email addresses)!**

Table B: Template for subsequent individual conversations

1	Present the purpose of the meeting ("agenda") and set the framework	*We have a maximum of 30 minutes for our session today. We should:* *- briefly evaluate the previous week and the home work* *-adjust the goal ladder /identify next step on goal ladder* *- schedule the next meeting*
2	Since last session?	Use open-ended questions: *-Can you briefly tell me about your week (successes, barriers / challenges)?* *- Try to describe what is happening when you meet barriers?* (Pay attention to any **control strategies** and **avoidance behaviour)**.

		- What do you do if you find that what we've agreed doesn't work? *- What would you have done in the past?* *- What do you think is the reason(s) why it was difficult for you to do "x"?* (Illness perception.) *- Is there anything we've talked about in the group sessions that you can apply?* Use the patient's answers/signs of motivation to find solutions/options and strengthen the patient's empowerment.
3	Include specific strategies if necessary	Relevant specific strategies can be selected and applied according to the patient's individual situation and needs (see **chapter 2 on "Level 3" and table 2** in the GAIN manual).
4	Progression on goal ladder (Appendix B)	What is the next step on the Goal Ladder? (Aim for SMART goals). Should the patient be challenged more or less? Should goals be adjusted? The therapist asks reflective and open questions to facilitate reflections in the patient that change maladaptive behavior and enhances the recovery process.
5	Brief summary	The therapist briefly summarises the next step on the goal ladder (i.e. the home work) and any adjustment that has been made. This ensures that the therapist and the patient have the same expectations for the next time. You may apply the Week Plan **(Worksheet D)** or another calendar to help the patient structuring the home work (when and how?).
6	Schedule the next session	When and how?

Appendix B. Practical examples

Example 1. To explore illness perception and illness behaviour and to apply the bio-psycho-social disease model

Below are examples of how the therapist may ask about the patient's challenges, situation, and illness perception / illness behaviour.

- *What do you experience as a challenge/problem?* For example, post-concussion symptoms and activities the patient cannot perform as before the concussion. Use the "Activity Questionnaire" (**Working paper A)** as a starting point.

- *Where in everyday life does it manifest?* Ask about a specific situation where the patient experienced a problem / a challenge.

- *Try to explain what happens when you do x / when you experience x?*

- *How do you understand the problem/symptoms? What do you think might be causing this?*

- *What do you do when the problem occurs? What did you experience when you did x?*

- *What else is going on in your life these days? How do you feel about it?* Explore stress-factors and contextual factors of importance, e.g. work, family, friends, school.

- *What are your expectations for the GAIN programme?*

- Ask more direct questions about how the patient is feeling by using phrases like
  How is your mood?
  How do you feel about yourself?
  Do you feel generally tense/overloaded?
  Are you able to relax?

  If you (the therapist) elaborate on signals of emotional problems/reactions from the start, you demonstrate to the patient that he / she can talk about things other than post-concussion symptoms and daily activities, and that emotions are important.

Example 2. Modifying illness perceptions

Below are examples of how therapists may use the dialogue to nuance the patient's understanding of their illness.

Based on the "Bio-psycho-social disease model" **(Tool 1),** the therapist may support the patient in becoming aware that many different physical, psychological and social factors have an impact on his/her overall level of functioning.

The therapist may normalise the symptoms and reassure the patient. You can refer to the education from the group sessions: based on today's knowledge, a concussion does not cause irreversible brain injury, but temporarily disturbs brain function (see also **box 2 in the manual**).

As in the example below, the starting point should be the patient's symptom(s) and perception of the concussion.

Examples:

- *I can hear that you're worried that your dizziness is due to irreversible brain damage. I can reassure you that it's completely normal to experience dizziness from time to time and that there may be many different causes of dizziness. In addition to being related to your concussion, many other factors may cause dizziness, just like before your concussion. For example, it's completely normal to react to strain and stress with dizziness. Could this be the case for you? We've talked a lot about you feeling overloaded over the past few months.*

- *It's normal to react to strain and stress with physical symptoms. (Example: anxiety / physical symptoms associated with going to an exam or a job interview). Your symptoms are harmless, but I understand they are unpleasant and worry you.*

- *Based on what we know about concussions today, there is no evidence that the brain is permanently damaged by a concussion. Remember in the first group lesson we talked about how a concussion seems to affect brain functioning and may also cause some microscopic damage to the brain cells and their neurons? But the brain is healing after a concussion and brain function normalises. For some, the healing process takes only a few days, and for others it takes a little longer. But after about a month, it's unlikely that the blow to the head in itself can explain the symptoms that some people still experience.*

Example 3. Modifying fear-avoidance behaviour

The therapist should pay attention to whether the patient expresses avoidance of certain stimuli or activities (physical or cognitive).
Some people avoid activities because they find it uncomfortable to move and/or because they have been advised to do so. These patients can often be reassured that the discomfort is normal and can be supported in graduated return to activities / exposure.

Other people avoid activities out of fear that it will make things worse. They fear negative consequences such as further brain damage or prolonging the symptoms. This may be conceptualized as **fear-avoidance behaviour**: the symptoms and activities (or just the thought of them) provoke anxiety, which is kept down (controlled) by avoiding the activities in question. Some people have a conscious picture of what they think might happen. For others, the imaginations are not very concrete, and the avoidance is almost unconscious. In case the patient experiences anxiety, it can be difficult to reasssure the patient. It may be important that the thoughts and beliefs behind the discomfort/anxiety are verbalized, and to identify the patient's reactions as anxiety symptoms. However, this does not resonate with all patients.

If fear-avoidance behaviour is suspected, the therapist can investigate *why* the patient avoids the activity in question by

- exploring the patient's *understanding of the symptoms* and what impact this may have on behaviour, including exploring any **catastrophic thoughts** (*what do you imagine might happen?*);

- using **gradual exposure** to the activities in question by graduating the level, intensity and duration of the activity. Here, it may be necessary for the therapist to "push a little" and challenge the patient, even if an anxiety reaction occurs, if it is at a level where the patient can participate and the anxiety level does not get too high. You can articulate to the patient that the best way to treat anxiety is to expose yourself to what triggers the anxiety one step at a time, so that you (or "the body and brain") "learn" that it is not dangerous.

If the patient is concerned that an increased level of symptoms may make the situation worse / aggravate a suspected brain injury, the therapist can try to reassure the patient and normalise the symptoms, for example by using phrases like below.

- *Remember how we talked about in the first group lesson that you can't damage your brain by being physically active and exercising (or anything else, like "challenging it to do maths") several months after a concussion? On the contrary, we know that exercise and physical activity is healthy (or "it's good to challenge yourself mentally"), even after a concussion.*

- *You've told me that in the last few months you've been very inactive. Your body (or "your brain") will respond to you challenging it again. This is completely normal and inevitable, but it's not*

dangerous. As you told me, the discomfort passed quickly, so it doesn't indicate that you overloaded yourself. What do you think about what I'm saying?

- *Remember in the group meeting we talked about how thoughts, feelings and symptoms from the body can often slow us down when we challenge ourselves and start taking steps towards the goals we have set? (Perhaps apply **Tool 7** and explain the connection between thoughts, feelings bodily reactions). You get the thought that the pounding in your head means you are doing more damage to your brain. That thought makes you scared and worried. And that in turn makes you stop running (or anything else, e.g. "put the books away"), i.e. blocks you from doing what you want to do.*

As described in the manual, GAIN builds on the assumption that a slight worsening of symptoms during and immediately after activities is harmless. As a rule of thumb, a worsening of symptoms should not last until the next day. You can, for example, formulate it this way to the patient:

- *It's inevitable that your body/head "makes some noise" when you start challenging yourself again. But if we find the right level to challenge you, the symptoms will subside again, either immediately or within a few hours. If you don't feel worse than usual when you wake up the next morning and it doesn't take you several days to recover from x, you've challenged yourself at an appropriate level. If you feel worse over several days, try reducing the intensity or duration of x next time.*

The therapist can compare with examples the patient may know from before: how the body can react with headaches or dizziness when starting everyday life after a tough virus infection; how the muscles may react when starting to exercise after a long break; how the eyes react to light when coming out of the darkness of the cinema etc.

Example 4. Working with a maladaptive and fixed perception of concussion

Below are examples of how a therapist can handle a patient with a fixed or unnuanced understanding of the concussion and the symptoms (i.e. an understanding that the symptoms are directly caused by the concussion / brain injury and will never go away).

The therapist should try to avoid a discussion about who is right and instead focus on what the patient - regardless of the cause of the symptoms - can do to get better.

Examples:

- *I don't think you've suffered permanent damage to your brain that is causing your headaches today. But regardless of how your brain is affected by the concussion, it's not something you can directly treat (e.g. medically, with massage or similar) to make your symptoms go away. On the other hand,*

there are several things you can do yourself to feel better/function better. This would also be the case if you had been diagnosed with a more severe brain injury. Would you be willing to let us look into it?
Depending on the patient's challenges, you can then look at different options based on the bio-psycho-social model (sleep, exercise, diet, stress reduction, etc.)

- *Many who suffers a concussion are afraid that it's dangerous to exercise after a concussion if you get a headache. People with brain injuries can also get headaches from exercise, but they are encouraged to exercise anyway and it is not dangerous for them. However, all people will function less well if they don't exercise. So, even though it's difficult for you in your current situation, I would suggest that we look at how you can start exercising. What do you think about that?*

Example 5. Guidance targeted to specific symptoms (Table 2)

Below are examples of how to help a patient who particularly complains about cognitive disorders. For example, a high school teacher who has trouble concentrating when marking essays.
(The same approach can be adapted for the other symptoms from Table 2.)

The therapist can

- Investigate what the patient experiences when trying to do something mentally demanding such as marking essays. Losing the thread, having difficulty remembering, getting headaches? Or something else?

- Normalise cognitive disturbances after concussion (e.g. based on the bio-psycho-social disease model **(tool 1)** and the pyramid of cognition **(tool 15)**. Explain that cognitive difficulties such as difficulty concentrating can have many causes. Compare this to how lack of sleep, stress/overload can make it harder to concentrate in everyday life. The therapist can use themselves as an example, perhaps the patient can recognise the examples.

- Reassure that challenging your brain with mentally demanding work after a concussion is not dangerous: you can't damage your brain by doing so.

- Guide the principle of gradual return to cognitively demanding activities (eg. by using the goal ladder, **work paper B**).

- Provide guidance (based on the bio-psycho-social disease model, **tool 1**) on how to improve cognitive function by focusing on the basic factors i.e.stabilising diet, exercise, sleep, and thereby strengthen the body's resources