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Evidence of Occupation-Based Interventions for Acute Inflammatory Demyelinating Polyneuropathy Symptoms: A Critically Appraised Topic

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Clinical Scenario

Polyneuropathies cause damage to multiple peripheral nerves on both sides of the body, resulting in sensory loss and weakness of the extremities (Bautista & Grossman, 2014; Mayo Clinic, 2019). Guillain-Barre Syndrome (GBS) is a disorder with an unknown distinct cause that consists of a person's immune system destroying the cells within his or her peripheral nervous system occurring in stages (Mayo Clinic, 2020; Sawant & Ferzandi, 2015). Acute inflammatory demyelinating polyneuropathy (AIDP) is an auto-immune inflammatory polyneuropathy that is a variant of GBS (Alessandro et al., 2018; Bautista & Grossman, 2014; Brooks, 2014; Mayo Clinic, 2019; National Institutes of Neurological Disorders and Stroke [NINDS], 2018). Each year, GBS affects populations regardless of their cultural and social background, age, or gender at a rate of about 1 to 2 persons in a 100,000 population (Hanson, n.d.). According to the Center for Disease Control (CDC), there are approximately 3,000 - 6,000 reported cases of GBS in the U.S. in any given year (2019). GBS is more common in individuals with underlying medical conditions, and these conditions include (but are not limited to): (a) diabetes, (b) heart disease, (c) congestive heart failure, (d) cancer or history of cancer, and (e) obesity (cdc.gov, 2019). The CDC (2019) mentioned that the risk of getting GBS increases with age and is more common in older adults, especially in adults over the age of 65 years.

AIDP and GBS are characterized by rapidly progressive, degenerative symptoms (Brooks, 2014). Treating GBS during its early stages is most beneficial in slowing the progression of symptoms (Bautista & Grossman, 2014). Due to the demyelination and damage of peripheral nerves, sensory reception and integration are compromised in individuals with AIDP (Mayo Clinic, 2019). Specifically, there may be bilateral sensory loss in the upper extremities, particularly in the digits, arm, and forearm (Zink & Philip, 2019). This loss of sensation, along with muscle weakness that can lead to acute, non-traumatic paralysis, inhibits the affected person’s ability to effectively engage in activities of daily living (ADLs), social interaction, leisure, and environmental interactions (Bautista & Grossman, 2014; Ko, Ha, & Kang, 2017).

Occupational therapists can assist individuals who are affected by AIDP in their every day meaningful occupations by utilizing interventions that can reduce their sensory loss and improve their functioning. Individuals experiencing AIDP with severe nerve damage can sustain decreased quality of life when unable to engage in their meaningful occupations (Brooks, 2014). This can be remediated through occupation-based interventions specific to the individual’s interests and values (Stonner, Mackinnon, & Kaskutas, 2017). Though there are interventions that target muscle power and the improvement of upper extremity strength through rote exercises, those interventions lack the occupation-embedded exercises critical to the occupational therapy profession (Dahi, 2019; Khan & Amatya, 2012; Roll & Hardison, 2016). Due to the differing severities of AIDP, improvement in upper extremities and interventions must be graded to match the functioning levels of individuals (Sawant & Ferzandi, 2015).

Occupational therapy considers the environment in which occupations are completed and how the occupations may be altered or modified to ensure an appropriate performance range is met for successful functioning in individuals with AIDP (Brooks, 2014; Dunn et al., 1994; Stonner et al., 2017). In addition, occupational therapy can be useful in restoring sensory loss and upper extremity functioning following the Ecology of Human Performance (EHP) model (Dunn et al, 1994). The EHP model consists of the importance of the individual's context or task and distinct changes that can be made outside of the person to increase his or her occupational performance range (Dunn et al., 1994). According to the EHP framework, the

context includes temporal (age, developmental stage, life cycle, and health), physical (natural and simulated or contrived), cultural (larger groups that can impact who the person is and how the person views himself or herself), and social (family and friends) components that impact the person externally (Dunn, 2017). These contexts can support or hinder the person's ability to complete tasks; those tasks the person is successful at engaging in are considered to be inside the person's performance range (Dunn, 2017). An occupational therapist can assist with increasing the individual's performance range by making changes to the individual's context and tasks (adaptations) or by establishing/restoring the person's abilities and skills (Dunn, 2017). The occupational performance range for individuals with AIDP is increased through adaptations and the establish/restore approach by strengthening reconnections of neuronal plasticity (Dunn, 2017; Dunn et al., 1994; Zink & Philip, 2019). An occupational therapy practitioner can work with these individuals in many settings such as rehabilitation facilities, inpatient hospitals, outpatient clinics, and community-based settings by modifying the individual's environment or tasks to ensure the range of occupational performance is widened (Dunn et al., 1994).

Limited research articles have been developed in the field of occupational therapy specifically for the treatment of adults with AIDP and adjusting an individual's contexts or tasks to improve their occupational performance range (Alessandro et al., 2018; Dunn et al., 1994; Probasco et al., 2017). GBS, which is an overarching condition that includes AIDP, has been more heavily researched in the field (Bölükbaşi et al, 2019; Cetiner et al., 2019; Fosberg et al., 2006; Hanson, n.d.; Ko et al., 2017; Sejvar, 2011; Tomita, Buckner, Saharan, Persons, & Liao et al., 2016). Therefore, there is a need for a review of the available literature on AIDP and GBS interventions to determine the best options for evidence-based treatment concerning the context, task, and person within the field of occupational therapy (Dunn et al., 1994).

Focused Clinical Question

What is the evidence for occupational therapy-related interventions on upper extremity nerve regeneration and sensory function improvement in daily life activities, social interaction, leisure, and environmental interactions for adults diagnosed with acute inflammatory demyelinating polyneuropathy?

Summary of Search

We completed a literature search between February 27th, 2020 and March 3rd, 2020. The total number of articles we reviewed were gathered from the Cumulative Index of Nursing and Allied Health Literature (CINAHL) Complete, PubMed Central, the American Journal of Occupational Therapy (AJOT), and Mayo Clinic Proceedings (see Figure 1). Due to each of us completing individual searches in the databases, there was potential for some overlap in our number of results found initially before applying our inclusion and exclusion criteria. The key terms we used in our searches were: *Guillain-Barré syndrome, occupational therapy, peripheral nerve injury/damage, sensory loss, acute inflammatory demyelinating polyneuropathy, upper extremity sensory loss*, and *demographics*. We combined these terms using the Boolean search technique. Pairing "acute inflammatory demyelinating polyneuropathy" with "occupational therapy" helped us realize there was a gap in the literature due to the limited evidence available specifically about occupation-based interventions for this condition. In addition to our article reviewing, we reviewed "Occupational Therapy for Physical Dysfunction" (Latham & Bentzel,

2014) and “Porth’s Pathophysiology: Concepts of Altered Health States” (Bautista & Grossman, 2014). Additional articles were found to support our understanding of our topic and its prevalence among certain populations through searches via Google Scholar.

The articles from our initial searches were broad and did not relate to occupational therapy. Many articles were medical-based, in that the treatment did not include interventions within the scope of occupational therapy. We did not include articles with medical conditions that did not pertain to AIDP, such as strokes or traumatic brain injuries. Several articles were found on chronic demyelinating polyneuropathy. However, it was determined that the progression of these diseases were too different to include both, as the interventions for chronic demyelinating polyneuropathy varied from AIDP.

Figure 1.
Flow Diagram of Article Exclusion Process

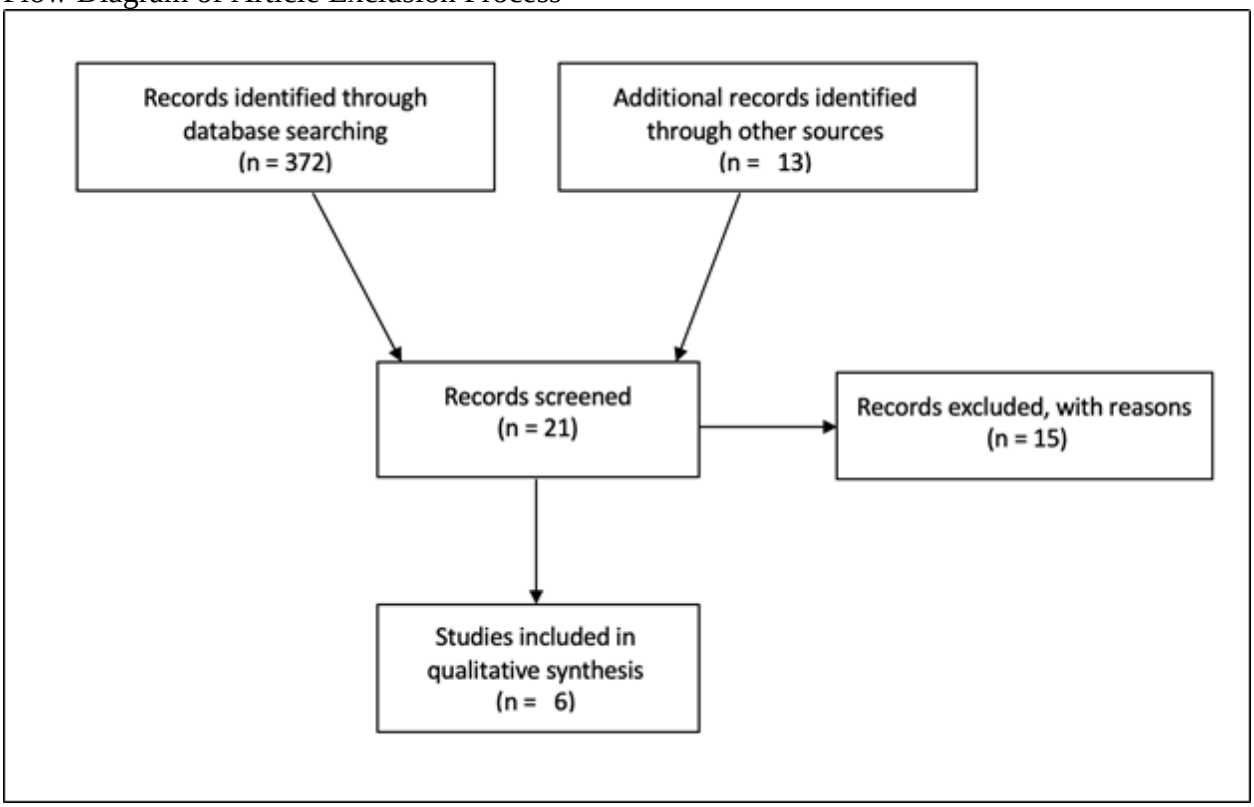

Figure 1. The process of article selection with numbers as they were excluded from our final number of articles utilized in this appraisal of literature focusing on AIDP or GBS. Adapted from “PRISMA Flow Diagram,” by D. Moher, A. Liberati, J. Tetzlaff, and D. G. Altman, 2009, *PLoS Med*, *6*. Copyright 2009 Moher et al. by the Creative Commons Attribution License.

Our exclusion criteria initially consisted of articles that were not published within the last 5 years (apart from a few articles that were deemed important to include). We excluded articles that contained “.com” addresses when gaining more information about AIDP. As we were completing our search, we began finding the majority of the authors focusing on sensory loss and nerve damage of patients who had experienced strokes. We determined that the implications of strokes were not similar enough to that of AIDP to include, this meant that articles where the authors focused on sensory loss or nerve damage after strokes, were excluded.

In our initial search in which we found 21 articles, we hoped to include articles that consisted of the use of occupational therapy in the treatment of AIDP. When comparing our

results, we noticed that there was not only a gap in the use of occupational therapy in AIDP treatment, but there was also a distinct lack of occupation-based interventions. Therefore, we added occupational therapy treatments that were not occupation-based as an additional inclusion criterion.

Articles that were included in our final review were studies of individuals with acute demyelinating polyneuropathy. GBS was included due to the syndrome having an acute onset that relates to our specific topic and there being more studies done focusing on GBS. The articles pertaining to occupational therapy or interventions that can be used to increase or improve polyneuropathy were included despite not having occupational therapy services. Peripheral neuropathy and peripheral nerve sensations or loss of sensations in upper extremities were included. We included 2 articles that were outside of our five-year limit due to the author's specific focus on occupational therapy and its importance on the improvement of daily life activities (Brooks, 2014; Khan & Amataya, 2012).

Summary of Best Evidence

Of the 21 articles we found in our initial search, 6 studies were included in a further critique due to their inclusion of specific occupational therapy interventions (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). Five of the articles were determined to be NA (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Tomita et al., 2016) regarding their level of evidence, while the sixth article we reviewed was a level III study (Sawant & Ferzandi, 2015). The study designs included case studies (Ko et al., 2017; Dahi, 2019), a case report (Tomita et al., 2016), a narrative (Brooks, 2014), a qualitative systematic review (Khan & Amatya, 2012), and a pretest-posttest (Sawant & Ferzandi, 2015). Only 27 participants with a diagnosis of AIDP or GBS were involved in occupational therapy interventions amongst the studies we found, excluding Khan and Amatya (2012) (Brooks, 2014; Dahi, 2019; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). Most of the participants in these studies were male, with ages ranging from 20 to 72 years old (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). The length of the intervention programs were between 8 weeks and 19 months (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). Settings in which the interventions took place included inpatient hospital (Brooks, 2014; Dahi, 2019; Sawant & Ferzandi, 2015; Tomita et al., 2016), outpatient hospital (Ko et al., 2017), home care (Khan & Amatya, 2012; Tomita et al., 2016), and community (Khan & Amatya, 2012).

Interventions that were investigated included range of motion (ROM) (Khan & Amatya, 2012), increase of strength (Dahi, 2019; Ko et al., 2017; Sawant & Ferzandi, 2015), (c) isometric and resistance exercises (Dahi, 2019; Ko et al., 2017; Tomita et al., 2016), movements related to the performance of activities of daily living (ADLs) (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016), stretching (Dahi, 2019; Sawant & Ferzandi, 2015), strategies for conserving energy and decreasing levels of fatigue (Brooks, 2014; Sawant & Ferzandi, 2015), and the use of resources and groups to enhance community participation (Khan & Amatya, 2012; Tomita et al., 2016). The ultimate goals of occupational therapy described were to improve performance in ADLs/IADLs (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016), encourage community integration (Khan, & Amatya,

2012; Tomita et al., 2016), improve emotional state (Brooks, 2014; Tomita et al., 2016), enhance muscle strength and functioning (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016), increase range of motion (Khan & Amatya, 2012), decrease fatigue (Brooks, 2014; Sawant & Ferzandi, 2015), and conduct safe transfers (Dahi, 2019; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). Several authors suggested that occupational therapists should conduct annual follow-up evaluations, as impacts on ADL performance and overall muscle functioning may be present in individuals up to six years after the onset of GBS (Brooks, 2014; Khan & Amatya, 2012; Ko et al., 2017; Tomita et al., 2016).

A common strength among all of the articles is that the interventions were all established to improve participation in occupations, with all of the authors noting that addressing muscle functioning in intervention is necessary to improve ADL performance (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). Another strength was that all results showed individual improvements in each study's specific areas of functioning addressed by intervention programs (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). This contributed valuable evidence in support of the role occupational therapy can have with AIDP/GBS patients. Occupational therapy can help enhance each person's performance range within various physical and social contexts (Dunn, 2017). A common weakness was that, while the therapeutic "ends" were occupation-based, the therapeutic "means" of the intervention were not occupation-based (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). This weakness contradicts the unique contribution that occupational therapy offers of using occupation both as an end and a means, and only one author mentioned the need for more evidence of using ADLs as a therapeutic means (Ko et al., 2017).

Conclusions

With a limited number of articles available specific to the use of occupational-based interventions that are successful in treating sensory function in people who experience AIDP, the articles we appraised consisted of similar findings after considering ways to improve functioning. Khan and Amatya (2012), after completing their review of information related to occupational therapy and AIDP rehabilitation, found that occupational therapy can have an effect on those with GBS and improve their functioning. Ko et al. (2017) discovered through their study that patients who had GBS performed better after their 12-week intervention program consisting of activities of daily living and exercises to increase muscle strength coupled together. They recorded scores throughout their program using the Barthel Index which indicated an increase in performance while utilizing occupation-based interventions (Ko et al., 2017). A "comprehensive search found a limited number of robust, methodologically strong studies evaluating the effectiveness of rehabilitation intervention" (Khan & Amatya, 2012, p. 519), though this limitation is not due to unsuccessful interventions; it is related to the rarity of the condition creating the lack of information available (Kahn & Amatya, 2012; Ko et al., 2017). The use of multiple individual GBS cases combined has been the consistent form of gaining information specific to occupational therapy interventions for the condition (Ko et al., 2017).

Sawant and Ferzandi (2015) found the same lack of evidence-based interventions when considering occupational therapy for patients with GBS in their study that looked at how fatigue could be decreased, and quality of life could be improved. Dahi (2019) found an improvement in quality of life when the patient participated in a range of daily living activities after utilizing a combination of isometric and resistance training. Occupational therapy is beneficial for individuals with GBS in that they can experience a decrease in fatigue and an improvement in quality of life after intervention programs or specific treatment when it is specific to the individual's goals and motivations (Brooks, 2014; Dahi, 2019; Sawant & Ferzandi, 2015). With continued and long-term intervention, the benefits of occupational therapy can expand into community reintegration for patients with GBS and increasing the number of goals achieved while improving their functioning in daily activities (Brooks, 2014; Tomita et al., 2016). The dilemma discovered is that most studies are built upon programs that do not utilize occupation-based interventions that are true to the profession, further exemplifying the gap in treating GBS or AIDP with sound and professionally specific occupational therapy interventions (Brooks, 2014; Dahi, 2019; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016).

Clinical Bottom Line

What is the evidence for occupational therapy related interventions on upper extremity nerve regeneration and sensory function improvement in daily life activities, social interaction, leisure, and environmental interactions for adults diagnosed with acute inflammatory demyelinating polyneuropathy?

Polyneuropathies involve demyelination or degeneration of nerve cells that can "lead to symmetric sensory, motor, or mixed sensorimotor deficits" (Bautista & Grossman, 2014, p.467). Symptoms for polyneuropathies include (but are not limited to): (a) muscle weakness, (b) inability to touch or feel, (c) loss of position of limb(s), (d) and interference of temperature and pain sensation (NINDS, 2018). These symptoms typically begin in the ends of the limbs and the majority of cases are "length-dependent, meaning the farthest nerve endings in the feet are where symptoms develop first or are worse" (NINDS, 2018). Guillain-Barre Syndrome (GBS) is a well-known form of polyneuropathy in which a person's immune system destroys cells in their nervous system (Mayo Clinic, 2020; Sawant & Ferzandi, 2015). The most common form of GBS is acute inflammatory demyelinating polyneuropathy (AIDP), a condition that is rapidly progressive and includes degenerative symptoms (Dimachkie & Barohn, 2013; Brooks, 2014).

For patients with AIDP, occupation-based interventions are needed to improve daily life activities, social interaction, leisure, and environmental interactions by adapting the person's context and/or tasks to increase his or her performance range or restoring skills the individual once had before the onset of AIDP (Dunn, 2017). An initial evaluation can be used to assess the patient's current level of functioning and determine what his or her limitations are (Chisholm & Schell, 2019). It is important to look over the individual's chart and see if he or she has any coexisting medical conditions that might impact his or her therapy (Shotwell, 2019). The occupational therapist and the patient will collaborate to determine which areas of occupations the client is unable to perform successfully to set goals for intervention, specifically adaptation or establish/restore, to increase his or her performance range (Brown, 2019; Dunn, 2019).

Since AIDP is a form of GBS, looking at the different patterns for GBS will inform the rehabilitation process. GBS is consistent at three different stages (Mayo Clinic, 2020). According to Mayo Clinic (2007), after the first signs and symptoms for GBS, the condition tends to progressively worsen for about two weeks. Initial treatment involves supporting vital functions and prevention of further complications with treatment being the most effective when initiated early in the course of the disease (Bautista & Grossman, 2014). During this stage, it is important to maintain movement in the arms and legs to keep the patient's muscles flexible and strengthened (Mayo Clinic, 2020). Symptoms reach a plateau within four weeks and recovery begins, usually lasting six to 12 months, but for some individuals, it could take years (Mayo Clinic, 2020). During the recovery phase is when the rehabilitation team would work with the patient to improve muscle strength, range of motion (ROM), isometric and resistant exercises, and movements related to daily occupations (Mayo Clinic, 2020). A preliminary study published in the *Indian Journal of Physiotherapy and Occupational Therapy* showed there was significant evidence showing that occupational therapy interventions targeting fatigue results in an improvement in quality of life after completion of their program (Sawant & Ferzandi, 2015). However, the interventions in this study were not occupation-based (Sawant & Ferzandi, 2015), reflecting a common trend in research that there needs to be more research done on occupation-based interventions for polyneuropathies.

Interventions for AIDP can target a wide range of occupations and should be reflected in the client's goals. Basic areas of occupations to target include daily life activities, social interactions, leisure, and environmental interactions. AIDP is an exceptionally rare condition making the number of cases therapists see extremely small (Ko et al., 2017). Due to this, there is limited research on rehabilitation services for treatment and even a smaller amount of occupation-based interventions. The context in which interventions for AIDP do not need to be specific and can be completed anywhere that fits with the patient's goals (Brooks, 2014). There may need to be adaptations made to the patient's contexts and tasks to increase his or her performance range (Dunn, 2017). Social support and community involvement have also been helpful with increasing function (Khan & Amatya, 2012; Tomita et al., 2016). To ensure bias is limited and methods are met to ensure ethical provision of services, each patient needs to be considered as an individual (Shotwell, 2019). Given the wide range of patients that are treated for AIDP across different populations, the treatment plan should be individualized to their needs, wants, values, and expectations (Brooks, 2014). Due to the current research being done with small sample sizes and individual case studies, the intervention outcomes are less generalizable (Ko et al., 2017). Potential bias could include assumptions that one strategy for rehabilitation could work without utilizing evidence-based strategies.

It is important to acknowledge that AIDP can affect everyone differently and impact a wide range of occupations. When considering different intervention strategies, looking at an individual's context and environment as well as his or her personal goals will help maximize the individual's capacity for performance. Brooks (2014), having had GBS and being an occupational therapist, had a unique perspective on the role of an occupational therapist during therapy. She stated, "as an occupational therapist on the rehabilitation team, your ultimate role should be to enable patients to regain function so that they can live as independently, productively and meaningfully in the future as possible" (Brooks, 2014, p. 42). There is supporting evidence that occupational therapy interventions are effective. However, these interventions need to be occupation-based to be consistent with the profession of occupational therapy and ensure they target the individual's performance limitations from AIDP.

Key takeaways for occupational therapy practice for individuals with AIDP:

- Acute inflammatory demyelinating polyneuropathy (AIDP) is a rare inflammatory neuropathy belonging to the clinical spectrum of Guillain-Barré syndrome (GBS) (Brooks, 2014).
- There are a wide range of symptoms for AIDP that can lead to both sensory and motor deficits (NINDS, 2018). AIDP progresses extremely rapidly, so the earlier the intervention the better (Bautista & Grossman, 2014).
- A wide range of individuals can be affected by AIDP, and intervention should reflect appropriate adaptations, modifications, and restoration of skills and abilities to maximize occupational performance (Brooks, 2014; Dahi, 2019; Dunn, 2017; Khan & Amatya, 2012; Ko et al., 2017; Sawant & Ferzandi, 2015; Tomita et al., 2016). It is important to consider the person, tasks, and context when setting goals to expand their occupational performance range (Dunn, 2017).
- Due to the differing severities of AIDP, improvement in upper extremities and interventions must be graded to match the functioning levels of individuals (Sawant & Ferzandi, 2015).
- Symptoms of AIDP and GBS may impact occupational performance up to 6 years after onset, so continuing evaluation is important (Brooks, 2014; Khan & Amatya, 2012; Ko et al., 2017; Tomita et al., 2016).

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