



## PREVENTION &amp; REHABILITATION: EDITORIAL

## The Pilates client on the hypermobility spectrum

## 1. Hypermobility is not rare

The diversity of human movement quality and range that a Pilates Teacher sees on a daily basis can extend from the muscle-bound and significantly joint-restricted individual to those who are waif-like, with whole kinetic chain, contortionist-level, joint flexibility, and, often appearing in the same group class.

What an individual also brings into an exercise studio is not just their physical (biological) self but also the sum total of their whole life; their beliefs, experience, current mood and psychological set point (Diener et al., 2006) created by their physical, psychological and social history. Inter-relationships between their biology, psychology and social factors can create differing outcomes following treatment interventions, of which exercise is one. The biopsychosocial model, very much the focus of current physical therapies research (Nijs et al., 2013; Singla et al., 2015), has relevance within the rehabilitation space in the Pilates management of movement.

When a Pilates Teacher surveys a new class or individual in front of them, they are automatically assessing the client. Hypermobility range and its control will be one of the first things visible. Hypermobility has never been rare in a Pilates context, particularly as the discipline has always attracted those from movement backgrounds, particularly dance and gymnastics in which hypermobility may almost be the norm. It could be said that Dancers and Gymnasts 'self-select' from the hypermobile population due to their innate physical attributes.

Dancers' attraction to Pilates has a long history as early development of his ideas were cross-fertilised with his contacts with dancers such as Rudolph van Laban and Ted Shawn (of the Denishawn Dance Company) and later Ron Fletcher, Martha Graham and George Balanchine. From the 1940's onwards a mainstay of Joseph Pilates' clientele were dancers, having earned his reputation for efficiently returning them to the stage after injury (Latey, 2001). Such clients are used to movement, they have learned how to 'learn' movement and are trained to be highly body aware, having nurtured their movement control neuromuscular pathways from a young age. Dancers build muscular support and strength at a vital time of their development, moreover, they train their kinetic system to hold their joints to near optimal functional alignment. What is obvious today is that many individuals with hypermobile joint signs present to Pilates late in life. It is quite likely that these individuals have not experienced the potential positives an early life movement background can provide, or they may be further along the hypermobility spectrum, meaning they are in a risk group in which problems can develop regardless of any preventative behaviours consciously or unconsciously adopted early in life.

If in the dance, gymnastics and Pilates worlds, hypermobility appears to be common, what is its true frequency? In a Primary care

triage clinic Connelly et al. (2015) reported that 30% of attendees of the clinic had symptomatic joint hypermobility. Hakim and Grahame (2003) in their Joint Hypermobility paper, identified that the presence of joint hypermobility is influenced by age, gender and ethnicity; they reported in studies of younger people up to 35% of males and 57% of females show polyarticular hypermobility, and, a prevalence in the general population of 10%–20%. Clarke and Simmonds (2011) reported 55% of Omani women, between 18 and 50 years old attending a hospital physiotherapy service had evidence of Joint Hypermobility Syndrome (JHS). The prevalence is greater in the female population and those of African and Asian descent (Simmonds and Keer, 2007).

There has long been awareness of the presence of hypermobility within the human population and that it is a heritable condition. There is no cure for heritable conditions, just management of the signs and symptoms. Currently, it is believed that the best management is provided by a multidisciplinary, holistic approach that is patient centred. It has pacing and physiotherapy, especially exercise, at its centre. Outside of specialist centres, it is a spectrum still not well understood or managed at present (Simmonds and Keer, 2007; Palmer et al., 2017; Engelbert et al., 2017). Expert opinion identifies that exercise is the key intervention but best practice of its delivery has yet to be proven by high-powered RCT's (randomised controlled trial's) (Palmer et al., 2014; Web source 1). There are suggestions (Palmer et al., 2016b) that the effectiveness of therapy includes education and (physiotherapy led) exercise. It is therefore in the interests of the Pilates Teacher to have a basic understanding of the hypermobility spectrum. A Pilates Teacher should be able to provide some level of education and care to those attending their classes who exhibit generalised joint hypermobility (GJH). They should be able to recognise those further a long the hypermobility spectrum who may present with a potentially undiagnosed, and perhaps rarer form of heritable Ehlers Danlos Syndrome (EDS). A Pilates Teacher might advise their hypermobile clients to seek a referral for specialist assessment, but always deliver appropriate exercise supervision within the remit of their experience and training.

## 1.1. The hypermobility spectrum

The development of the understanding of the hypermobility spectrum is a classic example of an area of interest that in its early study developed a nomenclature littered with acronyms, current and past, but that may still be in use. A lot of the study of the hypermobility spectrum is in the diagnostic arena, and the information delivered can be both technical and tautologic which can be confusing to a practitioner or an individual with the condition. In 1988, 1998, and 2017 reclassifications of Ehlers-Danlos syndromes

(EDS) have occurred to standardise terminology due to advances in genetic testing, and future reclassifications are highly likely, especially as revision meetings are planned every 2 years. A Pilates Teacher should have familiarity with some of the terms used, historic and current, within the spectrum but be mindful of the current classifications. For example, the largest subset of the Ehlers Danlos syndromes (EDS) has most recently been termed Hypermobile-EDS (hEDS) whereas it has previously been known as EDS Type III, or EDS Hypermobility Type (Tinkle et al., 2017). Tinkle, on behalf of an International group of experts also proposes the combination of the clinical diagnoses of hEDS and JHS (Joint hypermobility syndrome) as they are often clinically indistinguishable from each other (see Table 1). Both are heritable connective tissue disorders (HCTD) and since they do not have a current genetic test, diagnosis can only be based on a clinical description (Tinkle et al., 2017).

According to Cathy Collier, Healthcare Information Officer for Ehlers-Danlos Support UK, the 2017 reclassification is particularly useful as for the first time Management and Care Guidelines have been put forward (Collier, 2017) at the same time as the reclassification.

The hypermobility spectrum described in Castori et al. (2017), starts with a simple explanation, that Joint Hypermobility (JH) also known as joint laxity or double-jointedness can be defined as the capability that a joint can have to move beyond normal limits. JH can present with no other signs or symptoms. It can be localised (LJH) usually affecting fewer than 5 joints, inherited, or the result of trauma, disease or training. Generalised joint hypermobility (GJH) can involve all 4 limbs and the spine.

The Beighton score, first described in 1973, is a reliable and commonly utilised tool particularly to find generalised joint hypermobility (GJH) (See Fig. 1.). Criticism that the Beighton score does not assess joints such as the shoulders, hips and ankle that are often involved in JH is also valid, but its frequent use over decades means that it has been kept as a current tool, partially to aid future research comparisons (Engelbert et al., 2017). The Beighton score can add up to 9 points and interpretation of the results is age-dependent with children and adolescents being identified as having GJH if they score 6 or above, adults under 50 if they score 5 or above, and those over 50 only need to score 4. A further 5 point questionnaire can assist in identifying GJH if an individual is 1 point off the cut off. (See Fig. 2). (Collier, 2017).

The Beighton score does not identify those individuals that present with symptoms and this is where the hypermobility spectrum starts adding the words 'disorder' or 'syndrome'. The Hypermobility Spectrum Disorders (HSD's) include; Generalised Hypermobility Spectrum Disorder (G-HSD), Peripheral, Localised and Historical subgroups.

In the hEDS grouping the syndromic and disorder classifications present when systemic manifestations of more generalised connective tissue disorders are identified. These features can include:

- Soft or velvety skin
- Mild skin hyperextensibility
- Unexplained striae (stretchmarks in the absence of weight change)
- Piezogenic heel papules (fatty extruding bumps at the heel)
- Abdominal hernia's

**Table 1**  
**Abbreviations within the hypermobility arena.** On the left side of the table acronyms without syndrome or disorder indicate the asymptomatic end of the hypermobility spectrum, the term syndrome or disorder denotes that symptoms are present associated within their part of the spectrum. Note the 2017 classification identifies over 20 types of EDS, 13 are named here, it is not within the scope of this piece to describe them. hEDS comprises over 80% of the EDS's (Tinkle et al., 2017).

Terminology	Also known as
JH	Joint hypermobility
GJH	Generalised joint hypermobility
PJH	(Asymptomatic) peripheral joint hypermobility
LJH	(Asymptomatic) localised joint hypermobility
GJH	(Asymptomatic) generalised joint hypermobility
JHS	Joint hypermobility syndrome
	HS
	BJHS
	From 2017 <sup>a</sup>
	hEDS
	Hypermobility syndrome
	Benign joint hypermobility syndrome
	Hypermobile Ehlers-Danlos syndrome
HCTD	Heritable connective tissue disorder
HSD	Hypermobility spectrum disorder
L-HSD	Localised-Hypermobility spectrum disorder
G-HSD	Generalised-Hypermobility spectrum disorder
P-HSD	Peripheral-Hypermobility spectrum disorder
H-HSD	Historical-Hypermobility spectrum disorder
EDS	Ehlers-Danlos syndrome
hEDS	Hypermobile Ehlers-Danlos syndrome
	EDS-Hypermobile type
	EDS-Type III
	From 2017 <sup>a</sup>
	JHS
	Ehlers-Danlos syndrome-Hypermobile type
	Ehlers-Danlos syndrome Type 3
cEDS	Classical Ehlers-Danlos syndrome
vEDS	Vascular Ehlers-Danlos syndrome
clEDS	Classical like Ehlers-Danlos syndrome
cvEDS	Cardiac-valvular Ehlers-Danlos syndrome
aEDS	Arthrochalasia Ehlers-Danlos syndrome
dEDS	Dermaosparaxis Ehlers-Danlos syndrome
kEDS	Kyphoscoliotic Ehlers-Danlos syndrome
spEDS	Spondylodysplastic Ehlers-Danlos syndrome
mcEDS	Musculocontractural Ehlers-Danlos syndrome
mEDS	Myopathic Ehlers-Danlos syndrome
pEDS	Peridontal Ehlers-Danlos syndrome
BCS	Brittle cornea syndrome
PoTS	Postural orthostatic tachycardia syndrome
FGD	Functional gastrointestinal disorder

<sup>a</sup> Tinkle et al. (2017) proposes the combination of the two undifferentiated syndromes hEDS and JHS.



**Fig. 1.** The Beighton score.  
The Beighton score can be calculated by adding the result of the score of these tests: One point is given for being able to place the palms flat on the floor while forward

- Widened scars
- Pelvic floor, rectal or uterine prolapse
- Dental crowding with a high or narrow palate
- Arachnodactyly (abnormally long fingers or toes)
- Longer arm span than height
- Heart issues - mitral valve, aorta dilatation

Symptoms along the spectrum can also include chronic pain, recurrent joint dislocations, including non-traumatic dislocations (frank joint instability). Some specific findings such as significant skin fragility, congenital hip dislocations, arterial rupture, other cardiac valve issues, or low muscular tone, among other symptoms may be found. Specific symptoms help in the diagnosis of other EDS groupings, but they are all part of the mild to severe symptomatic end of the spectrum.

Comorbidities are disorders that run concurrently with a primary disorder. In the Hypermobility Spectrum Disorders (HSD's) these can be key features that may be used by a Pilates Teacher to flag up an individual who may have a more symptomatic hypermobility that needs careful handling, and a slower progression of exercise. The Pilates Teacher might consider asking the individual whether they have linked their Hypermobility symptoms to their comorbidity. Often it is the weight of linked features that can help someone affected by an HSD realise that there may be a combined story to explain a lifetime of seemingly random issues. Especially when the western medicine model has created specialisms that appear to have resulted in highly trained Consultants who find it difficult to step back in order to see the bigger picture that an HSD can present as.

A key comorbidity is PoTS (postural tachycardia syndrome), a condition that can present with headaches, fatigue, palpitations, sweating, nausea, fainting and dizziness. These symptoms are related to the inability of the body to adjust to postural (orthostatic) change especially from lying down to standing up causing the heart rate to increase significantly. It is related to the autonomic nervous system, the sub-conscious body system regulation controller, and is linked to the chemicals of the stress, 'fight or flight', response. ([Web source 2](#)).

Another possible comorbidity involves functional gastrointestinal disorders (FGD's), that may involve symptoms of abdominal pain, bloating, nausea, diarrhoea, and constipation. FGD's are becoming increasingly recognised as being commonly associated with joint hypermobility ([Fikree et al., 2017](#)), especially in children ([Kovacic et al., 2014](#)). Other autonomic related comorbidities include Chronic Fatigue that may be directly related to the effects of the disease burden associated with autonomic symptoms ([De Wandele et al., 2014](#)). GJH is more common in individuals with Chronic Fatigue syndrome and Fibromyalgia, overlapping disorders, though diagnostically different, compared with healthy volunteers. ([Nijs, 2005](#)).

Anxiety, panic disorder/agoraphobia was linked in a ([Bianchi Sanches et al., 2012](#)) systematic review with JH, though the underlying aetiology was reported as being controversial. Psychological and psychiatric involvement in HSD's are well described and in neuroimaging of subjects with hEDS increased activity in emotional processing areas has been observed which may explain the levels of anxiety reported in this group ([Bulbena et al., 2017](#)).

An important set of symptoms in HSD's are related to the fact that hypermobility itself can create secondary musculoskeletal

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bending with straight knees.

One point for each elbow that bends backwards 10° or more.

One point for each knee that bends backwards 10° or more.

One point for each thumb that touches the forearm when bent backwards.

One point for each little finger that bends backwards beyond 90°.

Answer Yes to 2 or more for a high prediction of hypermobility

- 1 Can you now (or could you ever) place your hands flat on the floor without bending your knees?
- 2 Can you now (or could you ever) bend your thumb to touch your forearm?
- 3 As a child did you amuse your friends by contorting your body into strange shapes OR could you do the splits?
- 4 As a child or teenager did your shoulder or kneecap dislocate on more than one occasion?
- 5 Do you consider yourself double-jointed?

**Fig. 2.** Hypermobility Questionnaire.

manifestations.

- Trauma - divided into macrotrauma, involving dislocations and subluxations and injuries to the soft tissues surrounding the joints, and microtrauma's the effects of which are more cumulative, perhaps resulting over time in osteoarthritic, recurrent or persistent pain
- Chronic pain - which could be related to increased sensitivity to pain (hyperalgesia) or neuropathies
- Disturbed proprioception - is a well observed phenomenon within the hypermobility spectrum, creating a mismatch between the perception of somatic inputs and the cognitive effort required for output, and may be a cause of the hyper-vigilance that hypermobile individuals are constantly demonstrating in movement situations
- Flexible flat feet
- Cumulative bony mal-alignments of great toes and elbows
- Spinal curvature alterations including scoliosis, both increased thoracic kyphosis and lumbar lordosis, or flexible reverses of the normal curvature in postures such as sitting

### 1.2. Management of the hypermobile spectrum

Dr. Jane Simmonds, an Australian Physiotherapist working in the UK, and Chair of the International Ehlers Danlos Syndrome Physical Therapy Clinical Guidelines working group, helps to clarify the management of the hypermobility spectrum in her presentation at the Ehlers-Danlos Support UK and the Hypermobility Syndromes Association joint conference in October 2017 ([Web source 1](#)).

She is very cognisant of the fact that members of the Physiotherapy profession are often uninformed both in the recognition of the hypermobility spectrum and its management. This has contributed to some poor reporting of the effectiveness of physiotherapy, which at worst has exacerbated symptoms, resulting in some physiotherapy practitioners being noted by hypermobility spectrum patients to,

- display a lack of understanding
- not listen
- not treat the whole person
- provide boring exercise/treatment
- be too vigorous and/or progress too quickly
- be over cautious or hands off ([Websource 1, Palmer et al., 2016a](#)).

Simmonds advocates the biopsychosocial model in the management of the hypermobility spectrum which includes a Holistic, Compassionate, Empowering and Evidence based approach - HOPE. It should include Education and Reassurance, and should direct those on the Hypermobility spectrum towards support groups. Therapy should be individualised, based on assessing the problems as presented by the individual, involving a problem solving, clinically reasoned, goal directed functional restoration

program. Exercise interventions have to be carefully implemented. The therapist should understand how to manage recurrent subluxations/dislocation with a 'Dislocation plan' acute management, with a 'Do Not Panic' headline, incorporating joint support, pain management - including pain killers and icing - time, and avoidance of prolonged immobilisation.

Assessing gait, posture, basic movements such as sit-to-stand, balance, coordination, joint repositioning drills, muscle engagement (slow motor unit dominant cognitive control) and cardiovascular/fitness assessment, allows the judicious application of remedial tactics. Simmonds' co-authored 2017 paper with first author Raoul Englebert is an important and up-to-date resource for any Physical therapy practitioner, including Pilates Teachers interested in working with Hypermobile clients ([websource 1, Engelbert et al., 2017](#)). [Simmonds and Keer \(2007, 2008\)](#) provide expert opinion on management.

From a Pilates perspective, slowly progressed graded exercise, cognitively addressing uncontrolled movements (UCM's) ([Comerford and Mottram, 2012](#)) through the full range of movement available, is important. The principles of centre, breath, concentration, control, precision, and (aiming for) flow seems to have been designed particularly for the management of those on the hypermobile spectrum.

### 2. A practical discussion of Pilates in the hypermobility spectrum

Pilates narrow focus on the assessment, exercise choice and delivery of exercise supervision, with its large back catalogue of exercises and an understanding of the gentle application of exercise, means it is well placed to be an adjunct to the multi-disciplinary team treating acute hypermobility-related problems. It is unlikely to be 'boring', no matter how gentle the exercise requirement, but comes into its own once problems become sub-acute or maintenance, or gently strengthening led. It is likely that a Pilates Teacher could be the only professional an individual on the Hypermobility spectrum may see year on year, all going well. But the Pilates Teacher must be a member of The Team, and refer onwards when necessary, and accept referrals to further the therapeutic goals.

When Pilates is the primary contact for someone with perhaps relatively light or no symptoms on the hypermobility spectrum it is important to remember that increasingly, hypermobile clients from non-movement backgrounds are presenting in a Pilates setting. They may have varying degrees of hypermobile issues, they may not have been diagnosed, have possibly been misdiagnosed and their hypermobility may be increasingly symptomatic, which may have been a driver to attend Pilates classes.

Pilates Teachers first task is to make a functional movement diagnosis. When working with hypermobility the primary interest is to understand where the client's hypermobility sits within the spectrum, which will help determine appropriate movement strategies, management and exercise choices.

How important are the classifications? Does it make a difference? While important from a medical management perspective, in a Pilates setting, classifications may be relatively irrelevant. Whether a client has a diagnosis, is seeking diagnosis or remains undiagnosed, for Pilates Teachers the issue is much more about how the client's hypermobility presents. What are their movement behaviours and how does their individual hypermobility manifest under movement instruction? What might be expected? What questions should a Pilates Teacher ask? What's in their toolkit of practical functional movement for that individual?

### 2.1. The clues

Assessing a Pilates client's hypermobility. To recap: while the Beighton Score is the most widely used tool for assessing hypermobility, it provides a description of hypermobility rather than a diagnosis. A significant limitation is that it only assesses 5 joints, excluding ankles, hips and shoulders, all of which are likely to be sites of instability. Additionally, and equally crucially for the purposes of Pilates assessment, the Beighton score does not address or assess symptomatic hypermobility where there is musculoskeletal and/or systemic involvement.

### 2.2. Client reports

Initial client assessment involves what the client tells the Pilates Teacher, what is asked and what information can be elicited from them. Where the client has not had a diagnosis of their hypermobility, a Pilates Teacher may well be the first to join the dots.

Most frequent presentations include tightness, pain, fatigue, anxiety, and often, when asked, dizziness and sometimes palpitations. There are paradoxes inherent in these presentations; reporting tightness yet demonstrating good to impressive range of movement; reporting fatigue, sleep disturbance or insomnia alongside demonstrable anxiety, nervousness and hyper-vigilance. Descriptions of pain and tightness may be generalised and are often vague, typically 'around' the shoulders and upper thoracic spine areas and in knees, sometimes hips – sometimes one, sometimes the other. 'It depends on the day'.

### 2.3. What can be observed?

Hypermobile individuals tend to be 'bulkiers' or 'non-bulkiers'; they either build muscle or not. Typically, 'bulkiers' may have a hypermobile range of movement but can have stability and are likely to manage load well. They tend to work globally. Non-bulkiers are likely to be inherently more unstable and may struggle with managing load and resistance. This may be due to faulty collagen, and the lack of recoil may impact the fascial system's capacity to absorb and translate force.

Observing whether the client has low muscle tone due to non-bulking and/or deconditioning will be evident, and will significantly influence movement diagnosis – heavy weights will be out.

Almost all hypermobile individuals appear to have a need for continual movement and feedback. They fidget and often feel a compelling need to stretch. This is a substantial clue to proprioceptive challenges and a hyper-vigilance indicative of autonomic involvement. The continual need to stretch is perhaps less about actually needing to relieve perceived stiffness and more about finding internal resilience and sensation. For hypermobile individuals, joint proprioception often 'doesn't kick in' until extreme end ranges.

Noting how the client reports can offer significant clues, particularly breathlessness and speed of talking which are indicators of anxiety levels as well as breath holding.

### 2.4. Joining the dots

Almost all hypermobile individuals, whether from movement or non-movement backgrounds are likely to have proprioceptive challenges. If the joints are not providing information to the brain, then it is important to recruit the deep muscles around the joint to provide a muscle spindle (the muscle's proprioceptor) feedback and provide compression, which can boost proprioceptive input.

Breath-holding is a significant factor in hypermobility and defines the pattern of acquired tightnesses. To get out of this substitution pattern of 'holding on', the client needs to start specifically recruiting the correct muscles in order to release compensatory holding ones.

Clearly, Pilates Teachers need to aid proprioception with as much input and information as possible. Feedback is key: hands-on cueing, the client's own hands-on and use of small props will aid the client's awareness and help bring them into their body.

### 2.5. Moving

Observation of test movements can be important to see how the client controls their movement.

### 2.6. Strategies

While a Roll Down is an informative assessment tool for a Pilates Teacher to use, if there is active PoTS, orthostatic intolerance or simply low blood pressure, it is probably not the best choice to start with. Equally, where there's an evident breath-holding pattern a Roll Down can induce dizziness.

An ideal start could involve harnessing the hypermobile individual's need for continual movement and feedback, making the movement a cleaner directional travel with background and engagement, starting and grounding from the feet up.

### 2.7. 'Harnessing the fidget'

An example of this can be started in standing, stepping one foot forward in a wide walk position and weight shifting forward and backward with the whole body. The Pilates Teacher can add arm movements for a more challenging load, and, in time, possibly a theraband to replicate fascial recoil. This movement helps 'harness the fidget' possibly kick-starting neuromuscular connections and new neural pathways. It may help initiate fascial engagement and tension as rocking from one foot to the other replicates the start of the fascial elasticity of gait. Equally, the rocking motion may have a neural calming effect. Slow-motion control of this movement may initially highlight coordination, balance, proprioception and breathing issues, all of which provide useful pointers for the Pilates Teacher to react to. Equally, and particularly in the case of low muscular bulk individuals, this movement may indicate if there is much fascial recoil engagement and give a crucial indication as to how this client might deal with load.

### 2.8. Breathing

Since breath-holding defines acquired tightnesses and overall muscular holding patterns, it follows that releasing those patterns and retraining breathing patterns is fundamental to a Pilates treatment plan for hypermobile clients. Through correct breathing the appropriate muscles can more effectively be recruited (Bradley and Esformes, 2014). Additionally, optimal breathing patterns have an inherent calming effect on hypermobile anxiety and hyper-vigilance, the indicators of a nervous system on high alert. It can take enormous energy to hold the body together when the

component parts are loose and sensation hard to find, and, in a Pilates setting the mind may well be on overdrive to compute instructions to translate into action. Using breathing to connect the client into their body and 'out of their nervous system' is key. Equally, clarity and calm in both cueing and instruction can foster a calmer nervous system response.

### 2.9. Mechanics

Alongside correct breathing, autonomic symptoms can be influenced through mechanical means such as pelvic rocking, rolling and unrolling through the spine, neural gliding and appropriate feedback. The neurodynamic elements inherent to Pilates are ideal for hypermobile individuals.

### 2.10. Pilates helps

Breathing is fundamental to Pilates practice and inherent to its principles. Through appropriate feedback, a Pilates Teacher can provide Pilates centric strategies for stimulating correct muscle recruitment and initiation which helps, over time, to release acquired tightness and associated pain. Pilates movements help the client establish body awareness and improve proprioceptive awareness. Forging new neural pathways and neuromuscular connections helps make a new brain map of the muscles. Again, with feedback and precision the client can learn internal resistance and stability improving their ability to control their movement. In practice this may mean establishing awareness of the difference between 'hanging' at end range (and off the nervous system) where proprioceptively they know where they are, and muscular engagement and the process of 'gathering' a term used to describe a regional synergy of muscular engagement.

At this point in time the levels of evidence that Pilates practice is efficacious for a hypermobile individual is only proven in lower order research. Pilates ranks third, behind swimming and walking in the types of exercise reported to be most helpful when 946 hypermobile members of two UK based Hypermobility support groups responded to a questionnaire looking at attitudes, beliefs and behaviours towards exercise (Simmonds et al., 2016). Interestingly, Pilates ranks higher than no exercise and Physiotherapy exercise, the next two reported 'most helpful' exercise categories. Research is clearly lacking in this area, but groundwork that must be completed before this field of study can produce robust evidence based treatment strategies is underway.

Pilates can ultimately be empowering for the client. It offers the potential to take hypermobility out of the medical model of management – as far as possible – and to make controlling it part of the fitness, exercise and wellness model.

### 2.11. Constructed case histories

To highlight this practical discussion, there are two case histories presented, at differing ends of the hypermobile spectrum, but both within the type of presentation that might be found within a Pilates Studio. Both have shoulder issues and share the same Beighton score.

These are written to provide the thought processes of the Pilates Teacher and reactions to assessment movements stimulating the exercise choice during a single session for Case Study one and three sessions for Case Study Two.

#### 2.11.1. Case study one

**Client background:** Ms. P, Female mid 30's Hypermobile acrobat/aerialist with history of subluxation in right shoulder. After some intensive physiotherapy the client is now pain free but

worries that the shoulder feels unstable and, given her work demand, is concerned this is an injury that could reoccur. She is 7/9 on Beighton Scale, with excessive hyperextension in the elbows.

**Assessment:** The right shoulder is being pulled slightly forward possibly due to tightening of pectoral muscles from her rope and trapeze work. There is obvious scapular winging and poor control of scapula/humeral rhythm on arm elevation along with a slight rib poke/give into extension, at the top of her flexion range of movement (ROM), this could be poor abdominal control of extension or tightness and over dominance in Latissimus Dorsi.

**4 point kneeling opposite arm and leg glides** demonstrated a lack of central control and support and an inability to control scapular winging. The Pilates Teacher provided the client with visual and hands on cueing to try to stabilise the exercise but the client found it very difficult to 'feel' how to control the shape. Intellectually she understood what was trying to be achieved but had a tendency to translate cues into gross movement, i.e. a rounded back rather than a supported neutral. The client is very strong and bodily able, but tends towards global stabilisation with a breath-hold and over muscular activation rather than a gentle 'just the right amount, at just the right time' approach. The Pilates Teacher's dilemma was how to get the client to feel the small, gentle approach to stability.

**Pilates Intervention:** Started with **breathing** to alleviate the breath hold, some **'sit fit'** (rubber wobble cushion) **lumbar pelvic stability** to bring awareness into centre, **supine opposite arm and leg glides** to check arm extension versus central stability avoiding any abdominal bracing, **bridging – long leg, feet on Swiss ball** to integrate movement control.

Performed **supported scapular isolations supine** so client could feel the scapular move across the ribcage wall. Then used a hands-on/'meet my resistance' approach to activate scapular connection to ribcage, Serratus Anterior and Obliques. Added a **short roller or Swiss ball to hold and connect into** and integrated the movement with the **bridging on a Swiss ball**. There was a strong impression that by connecting the Obliques and Serratus Anterior – the arms to the body really helped with the balance on the ball.

**Supraspinatus connection of arm into shoulder joint** - standing with 1 kilo weight in the right hand the Pilates Teacher cued the client to resist the pull of gravity and gently draw the humeral head into the shoulder socket using an image 'like you would suck a round lollipop into the mouth'. A mirror for visual feedback was used to reduce Upper Trapezius over activity but with hands on top of the shoulders and a subtle approach the client showed she felt her deep shoulder muscles reacting to the load. The Pilates Teacher used hands-on cueing to activate a small press back to emphasise connecting the arm into the back of the joint to open out the chest/pectorals.

**Roll down bar/band attached high – gentle lat press**, the aim here was to use to a small ROM but use load to connect the arms to the centre. In standing attention had to be paid to postural positioning, avoiding postural sway, timing to set the deep abdominal support, scapular and ribcage connection and humeral head into its' socket before pressing into the spring load, still being able to breathe was key to balancing out the effort required.

**Push ups** – As the client was used to working through her arms and responded well with load facilitation she was given the push up bar sprung from below; paying attention to the set up - the scapular positioned against the ribcage wall and timing - centre engaged before working against the load were key and the client initially demonstrated a 'shaky judder' as she worked into new neuromuscular pathways. "She could really feel where she was working from".

This exercise was altered to be a wall push up with a Swiss ball

for added stability control as part of the clients home exercise programme.

**Waiver with light circular band** – Once an awareness was established in her centre and a more stable connection of arm to body a small rotator cuff exercise was added with a light circular band. This was also given to her to use as homework.

### 2.11.2. Case study two

**Client background: Mrs T**, Female mid 40's with a long history (decades) of neck and right shoulder pain and discomfort, associated with headaches and reports she is easily fatigued. She has an EDS Hypermobility Type (now hEDS) diagnosis from a rheumatologist three years ago. Her Postural Orthostatic Tachycardic Syndrome (PoTS) is well understood and managed with movement control. She is currently being investigated for Gastro-Intestinal symptoms (bloating, alternating constipation and diarrhoea and suspected food intolerances). She is slender with limited cross sectional muscular bulk that is soft to palpate during active work. Skin extensibility on the flexor side of the forearm shows several cm of stretch. Her skin feels soft to the touch.

**Assessment:** She has a flexible rotational scoliosis presenting in an anti-clockwise rotation in the thorax, and clockwise in the lumbar spine. Her left shoulder is elevated, her right shoulder is tipped and forward. She speaks quickly and gives lengthy descriptive answers to assessment questioning. She appears hyper-inflated in the apices of the lungs. She rarely stays still.

An Initial Pilates assessment movement control test 'incline lean into the wall' elevates the left scapula and wings the right scapula while rotating the pelvis from one side to the other without being able to find a neutral position. She breath-holds and reports an increased awareness of tightness and pain in her neck and shoulder girdle. Evident postural-sway and shoulder girdle stability is poorly managed, under even the light load of an incline lean. Ramping up the load to facilitate proprioception and appropriate muscular recruitment did not appear to be appropriate, so it was decided to place the client supine, to off-load the weight of her head, and increase her base of support.

**Treatment:** Introducing just an exercise position has put the client in a heightened, over vigilant state with obvious anxieties surrounding movement. She reports 'hating PE at school and always feeling really uncoordinated'. First the Pilates Teacher had to calm the breathing down and start to bring the attention to the physical – a heavy head with some gentle neck releases with the head supported (given as a home exercise); then the Pilates Teacher introduced a deeper more lateral breath and started to connect that breath with the centre. This then meant Mrs. T was able to progress to knee floats, keeping an awareness of the central control.

2.11.2.1. *Session two.* The session started straight away with the **breathing** and **gentle supported neck releases**, which the client had been working on at home. She felt that this had helped to release some neck tension. **Knee floats** were okay but didn't seem to be making much sense to the client as she could intellectually understand the exercise but couldn't really feel if she was doing it correctly.

Changed the exercise to an **isometric single arm press** against the resistance of the Pilates Teachers hand and the client could really feel her body shift. This was discussed with an 'astronaut in space' analogy and the client was asked to see if she could anchor herself from her centre with just enough effort to stay stable, still being able to breathe freely and meet the hands-on resistance. A hands-on approach meant that The Pilates Teacher could control the load, feeling for the right amount of pressure to invoke a positive muscular response without over-compensation or instability; The Pilates Teacher attempted to establish a neuromuscular link

from the right arm to the shoulder girdle and ribcage, so activating an appropriate Serratus Anterior/Oblique response for scapular stability and abdominal stability, without bracing. The Pilates Teacher and client played around with angle and position of the press, a cross midline press highlighted the difference in the Obliques and poor recruitment patterns on the right side compared to the left. A leg variation of this exercise with an **isometric heel-press** away from centre, being cautious again that the load facilitation did not invoke a compensatory stabilisation pattern. Placing a theraband under the foot with an instruction to '**heel press into the band**' means this exercise can be added to the home programme. The elbows should be held in to the sides and shoulders well placed, to help recruit and connect into the scapular stabilisers and there should be a focus on breath while keeping a central balance.

2.11.2.2. *Session three.* Neck and shoulder tension was reportedly 'feeling good today,' so the session started in standing with some footwork – **calf raises and walks**. The Client was assessed for signs of Jaw clenching and any signs of dizziness. However the client's PoTS seemed well managed. The exercise did show up evident shoulder bracing for postural lift so there was discussion about supporting from the centre to allow the shoulders to let go. After recapping the last session's **supine isometric connection/centre work**, the client was visually looking happy and reported that she could feel her deep abdominals working.

Progressing on to **opposite arm and leg glides** using a band around foot and hand to closes the kinetic chain. This is to recreate the feeling of fascial recoil. Then a small Swiss ball placed under the torso for support is used in the **4 point kneeling position** to perform a **supported opposite arm and leg reach** and a small **supported transfer of weight** onto the hands. Attention to cueing stability at the shoulder girdle prepares the client for a supported **4 point kneeling push up**.

The Pilates Teacher was continually aware of the potential for orthostatic intolerance when moving from supine to standing, so change of position was executed with care, encouraging the client to sit for a minute or so in between supine and 4 point kneeling.

The Pilates Teacher had a Plan B, if signs of PoTS became evident, this was standing work against the wall, leans and push-ups with a ball, as an add-on progression from the initial movement-control test from the first session's 'incline lean into the wall' and to gauge progression of awareness and control.

## 2.12. Conclusion

There is no one-way to deliver a Pilates session to a hypermobile spectrum client and this format was used to show Pilates Colleagues the processes the authors use within their sessions, working with clients with hypermobility findings.

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