The MULTISENSORY Handbook
A guide for children and adults with sensory learning disabilities

PAUL PAGLIANO
Do you support a child or adult with sensory perceptual issues or cognitive impairment?

For people with challenging sensory and cognitive conditions, everyday life can become so unpredictable and chaotic that, over time, lack of engagement can often lead to a state of learned helplessness. In this insightful text, Paul Pagliano shows how ‘learned helplessness’ can be transformed into learned optimism through multisensory stimulation, and explains how a programme of support can be designed and modulated to match a person’s needs, interests and abilities. Full of practical, easy-to-use multisensory assessment tools and intervention strategies, this book will help the individual to

- foster a feeling of ease with the environment;
- experience pleasure and happiness in their surroundings;
- kick-start their desire to explore;
- improve their learning, social wellbeing and quality of life.

The author offers an abundance of exciting multisensory stimulation ideas that can be applied to communication, play, leisure and recreation, therapy and education. Practical resources also show how to monitor and review applications to ensure they are being used in the most effective and enjoyable ways possible.

Informed by an astute, up-to-date, comprehensive overview of research and theory, The Multisensory Handbook will appeal to primary professionals from a wide range of disciplines including education, health and social care.

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The Multisensory Handbook

A guide for children and adults with sensory learning disabilities

Paul Pagliano
For Fiona, Zachary, Christopher and Matthew
Contents

List of illustrations xi
Acknowledgements xiii

PART I
Multisensory stimulation 1

1 The senses and the brain 3
   Introduction 3
   Basic terms 4
   Nervous system 4
   Neuroplasticity 5
   Our senses are everything 6
   Sensory deprivation 8
   Early sensory stimulation approaches 10

2 Sense organs and sensory processing 12
   Introduction 12
   Sense organs 12
   The senses of interoception 14
   The senses of exteroception 15
   Sensory processing 19
   Sensory thresholds 20

3 Pleasure, happiness and Predictive Coding 23
   Introduction 23
   Down time 24
   It all starts with success 25
   What is success? 26
   Learned helplessness and learned optimism 27
Contents

What is pleasure? 28
Predictive Coding 31

4 Making sense: a developmental process 35
Introduction 35
Getting started 36
Halliday’s triptych 43
Making sense 44
The bridge is dynamic 45

5 Multisensory communication 47
Introduction 47
A bee story 48
Reflecting on the experience using semiotics 48
Tipping points 51
Multisensory communication 52
Care Theory 55

6 Design for multisensory stimulation 60
Introduction 60
The rationale 61
Design approaches 63
Olfactory space 69
Interoception space 71
White room 71
Dark room 71
Grey room 72
Acoustically sharp sound space 72
Acoustically dull sound space 73
Tactile space 73
Gustatory space 74
Interactive area 75
Water area 75
Soft play 76
Portable environment 76
Virtual environment 76
Inclusive area 77
Pluralist environment 77
Social space 77
## PART II
### A unified approach

7 **Establishing a caring relationship**
- Introduction 81
- Build on the relationship 84
- Mindfulness 85
- Beneficence and non-maleficence 87
- Employ a non-pathologising approach 88
- Work with the participant 88
- Design approaches for empowerment 89
- Go deep 90
- Recognise treatment may be flawed 91
  *Acknowledge that sometimes it might not be possible to help* 91

8 **Assessment**
- Introduction 92
- Types of assessment 94
- First steps 96
- Wellbeing 100
- Stereotypy 103
- Engagement 111
- Assessing the senses 112
- Interoception 114
- Exteroception 118

9 **Redesigning the environment**
- Introduction 132
- User-centred design 132
- Function-centred design 134
- Simplicity whenever possible 135
- Multiple methods to achieve the same outcome 135
- Slow design 137
- Design prototypes 138

10 **Beginning a sensory conversation**
- Introduction 139
  *Pleasure, power and meaning* 139
# Contents

11 Extending the conversation  
   Introduction 143  
   Modelling 144  
   Dialogue 145  
   Practice 146  
   Confirmation 147

12 Catching the wave  
   Introduction 148  
   Catching the wave 149

References 151  
Index 157
Illustrations

Figures

8.1 Four pillars of the unified approach to using multisensory stimulation 92
8.2 The emergence of the senses in the developing organism 114
11.1 Ways to generate new knowledge in the sensory conversation 143

Tables

8.1 Initial interview template 97
8.2 Wellbeing questionnaire template 101
8.3 Assessment of stereotypy template 105
8.4 Engagement template 113
8.5 Interoception template 115
8.6 Exteroception template – chemosensation 119
8.7 Exteroception template – somatic senses 122
8.8 Exteroception template – hearing 126
8.9 Exteroception template – vision 128
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Part I

Multisensory stimulation
Chapter 1

The senses and the brain

Introduction

This book investigates multisensory stimulation particularly in the context of children and adults with sensory and learning disabilities. We begin our journey by introducing the basic terms and ideas that will be required and then follow with an overview of the importance of the senses in human development, learning, functioning and wellbeing.

Our senses connect our brains to the concrete world (including our own bodies) and they are essential for our survival. There is still much debate as to exactly how many different senses we have, whether the number is five, sixteen or even higher, and their relative importance to each other. Needless to say, we are multisensory beings and we live in a multisensory world. We have a multitude of different ways to obtain information about the world and ourselves and when this information is efficiently processed, it provides us with a tremendously rich and sophisticated understanding of the world. It is this understanding that not only enables us to determine who we are and how we live but also, because it seems to happen so automatically, affords us the luxury of taking the whole process for granted.

The situation changes dramatically if we are in an environmental circumstance or we have some physical condition that precludes us from being able to engage with these sensory stimuli. Prolonged severe sensory deprivation has pervasive negative effects on every aspect of human functioning, development and wellbeing, including in extreme cases atrophy of the brain and even death. Sensory deprivation may occur because of environmental conditions, inadequate sensory processing, or a combination of both. It may occur at any age. Whatever the cause, however, the result is the same — sensory deprivation drastically reduces opportunities for self-determination and wellbeing.

Chapter 1 introduces the key terms and makes a start on developing a rationale beginning with the first principle, which is that we naturally function best at a multisensory level so whenever possible we need to provide multisensory stimulation. This book is an exploration of multisensory stimulation and how it can be employed to help people with sense disabilities to use their senses in the most gratifying and effective ways they can.
Basic terms

These are some of the basic terms used throughout the book:

- A sense is any faculty that accesses stimuli from inside or outside the body.
- Sense stimulation is anything that triggers activity in a sense nerve receptor. Anything seen are visual stimuli, anything heard are auditory stimuli, and so on for each of the senses.
- Perception is the process of becoming aware of, recognising and interpreting the stimuli.
- Sensory processing is an umbrella term that refers to the interface where a sense ends and where perception begins, to describe the two working in combination.
- Multisensory stimulation is stimulation that simultaneously appeals to more than one set of sense nerve receptors.

Nervous system

Our nervous system has much to do in order for us to become aware of, receive, organise and interpret sensory information and then to act on it. There is a continuous flow of information from the senses, through the nervous system to the brain, and back to the body parts. The brain sorts through the sensory information it receives to gain an understanding of what is happening inside the body, what is going on outside the body, assesses how these two sets of information may be interrelated and then determines what might be the best course of action. The brain makes decisions based on the totality of this information. Some of the processing is at a conscious or voluntary level and some of it is at a subconscious or involuntary level. For example we might put our finger on something that is dangerously hot. This sense information travels from the finger to the brain and then it travels back to the finger again with an urgent instruction to move it to safety. Simultaneously other information is sent to vital body organs such as the heart to prepare them for a state of full alert.

The nervous system consists of three subsystems: the central, the peripheral and the autonomic nervous system:

1. The central nervous system (CNS) comprises the brain, spinal cord and retina. The retina is an extension of the optic nerve and therefore contiguous with the brain. It is the only sense organ that is regarded as a part of the brain.

2. The peripheral nervous system (PNS) provides the communication channels between the CNS and the rest of the body. It is made up of the sensory division, and the motor division. The sensory division is called the afferent division because it takes information to the brain, nerve fibres conduct electrical impulses to the CNS, while the motor division is called the
efferent division because it takes information away from the brain, nerve fibres conduct impulses from the CNS to the muscles.

3 The autonomic nervous system (ANS) regulates the internal environment of the person. It conducts impulses from the CNS to the internal organs and glands. The system is involuntary. The ANS has two divisions, sympathetic and parasympathetic. The sympathetic division mobilises systems during activity, for example, fight or flight, with two arousal-neurotransmitters, epinephrine and norepinephrine. The parasympathetic division is involved in stimulation of systems active during periods of rest, for example, digestion, via the neurotransmitter acetylcholine.

A simple sensory stimulus, if powerful enough, triggers a nerve receptor, which can in turn set in motion a cascade of neural electrical impulses. A complex stimulus triggers a variety of nerve receptors, which can in turn trigger an even bigger cascade of neural electrical impulses. As the information travels through the nervous system it passes through relays called synapses. Here the information can be facilitated and/or inhibited, which ultimately influences how the stimulus is cognitively perceived. The process is dynamic.

**Neuroplasticity**

Through the neural pathways, a sensory stimulus causes changes in the brain. This idea is called neuroplasticity. Neuroplasticity is an incredibly complex process but results in the brain changing itself depending on the amount and type of stimulation it receives. Neuroplasticity challenges the idea that brain functions are fixed in certain locations. If one part of the brain is not used then it shrinks or another part of the brain takes over. The idea of neuroplasticity is a dynamic process that starts with Hebb's law. Hebb's law is the main principle of neuroplasticity. It states: 'neurons that fire together wire together' (Doig 2007, p. 63). When two neurons repeatedly simultaneously fire or one fires to set off another, chemical changes happen that forge stronger connections between those two neurons. The chemical changes happen where the neurons meet at the synapse. The synapse is the 'junction between one neuron (brain cell) and another, across which nerve impulses travel' (PositScience Companion Guide 2005–2007, p. 82).

Interaction involves both facilitation (helping – speeding up) and inhibition (hindering – slowing down). Being dynamic the process translates into behaviour that can be modulated and re-modulated and re-modulated – constantly changing – so if the sensory pathway is used it develops and strengthens and becomes more sophisticated – if it is not used it shrinks/fades/disappears. So to sum up, our brains change according to the stimulation we process – process being the operative word. These anatomical and physiological changes continue throughout the life of the individual.
Our senses are everything

All human experience depends on our ability to use our senses. Everything we do is informed by our senses. Each of our senses provides different types of information, which when processed, collectively bestows us with a tremendously rich, multidimensional understanding of what it means to be a human being. Naturally the more multisensory the experience, the more sophisticated our understanding is likely to become.

Multisensory stimulation not only makes it possible for us to survive but it also enables us to thrive in the environment in which we live. Furthermore multisensory stimulation plays a vital role in our personal wellbeing. The reverse is also accurate. Without multisensory stimulation we are cut off from ourselves and from the outside world. We are starved of our own humanity. This is because sensory stimulation is the source of all human meaning and enjoyment – our purpose and our rewards. Our relationship with our senses is what makes life worth living. Over time the way we perceive sensory stimulation becomes our own perception of ourselves. Multisensory stimulation therefore supplies the very building blocks of who we are and who we become.

In many ways our access to this stimulation is just taken for granted. This is because mostly our bodies automatically ensure we get the sensory stimulation we require for personal comfort, development, growth, happiness and ongoing maintenance. Furthermore our brains seem to effortlessly become aware of, recognise and interpret these stimuli. Just being in the world is usually enough to stimulate multisensory engagement with self, objects, other people and events. Because of our innate genetic programming as babies we simply learn to use our senses by using them and this is a lifelong process.

For most people this is a spontaneous, innate process but not always. Some, for example those with sense impairments, sensory processing difficulties or brain damage, may not have such a positive and dependable relationship with their senses. For them sense experiences may not even register and if they do, they may lack meaning, be profoundly problematic, unpleasant or even frightening.

Thinking about the senses as multisensory rather than as a disparate set of single yet isolated senses in competition with each other is a significant departure from the historical suppositions embedded in our culture and language. In his *A history of the senses: from antiquity to cyberspace* Jütte (2005, p. 54) observed that the ‘number of the senses... [was] set firmly at five both in the Western tradition and in early Indian and Chinese culture’. Apparently Aristotle (born around BC 348) not only identified five separate senses, he also pronounced their order of importance as being sight, hearing, smell, taste and touch. Even though nowadays these early notions of the senses are widely acknowledged as social constructs, it is important to be aware of how they have subtly and not so subtly influenced the way people generally think about the senses.

According to Korsmeyer (1998), over the centuries a philosophical argument transpired where sight and hearing were signified as superior because they were
thought to be more capable of accessing information from a distance. This apparently made such sense information more objective. However, as taste and touch access information from close proximity, so the argument goes, this made such information more subjective, self-indulgent and inferior.

In due course a binary opposition emerged with vision and hearing occupying positions of dominance, while taste and touch were determined to be more low-grade. A style of communication evolved where visual metaphors are commonly employed to evoke positions of power and authority. For example a politician being interviewed might begin a statement with 'look' or 'see here', expressions that subtly privilege the power of vision. Conversely Hull (2000) reminds us that in the Bible blindness is often associated with negative concepts such as sinful behaviour or not believing in God. Hull goes on to argue that the privileging of a particular sense leads to the privileging of people who have that sense at the expense of those who do not.

Recent scientific evidence now refutes Aristotle’s pronouncement. Rather than working in competition with each other, our senses naturally operate at their most efficient in cooperation with one another:

> There can be no doubt that our senses are designed to function in concert and that our brains are organized to use the information they derive from their various sensory channels cooperatively in order to enhance the probability that objects and events will be detected rapidly, identified correctly, and responded to appropriately. Thus, even those experiences that at first may appear to be modality specific are most likely to have been influenced by activity in other sensory modalities, despite our lack of awareness of such interactions.

(Calvert et al. 2004, p. xi)

As alluded to previously, nowadays there is debate as to precisely how many different senses we have. For example some argue that vision itself may constitute a combination of discrete senses: one to discern shape, one to discern colour, one to discern three dimensions. Touch can be subdivided into four discrete senses: temperature, vibration, pain and pressure.

However many there are, orchestration of all our senses is crucial. This is so information we detect about our internal selves and our external environment is processed swiftly and accurately, thereby setting us up to make the most appropriate response possible to ensure safety, security, nourishment, reproduction and overall wellbeing. Our brain, the senses and multisensory stimulation all work together. Multisensory stimulation is essential for neuroplasticity to occur.

Modern research indicates that the more multisensory the stimulation, the more likely it will be perceived in more accurate, valid and dependable ways. This is a tremendously important point, especially when working with people who are experiencing difficulties with their senses, perception and sensory
processing, because it implies that a more holistic approach may provide a key strategy to help them overcome their difficulties.

**Sensory deprivation**

A litany of unpleasant scientific research reports exists in the literature detailing the insidious negative effects of sensory deprivation on animals and insects and how this lack of stimulation causes abnormal behaviour. Sadly many examples also abound that catalogue the extreme negative effects of sensory deprivation on humans, particularly children. Prolonged sensory deprivation in young children evidently results in severe disturbances in physical development, social and emotional functioning, behaviour and communication, learning and even compromises the very survival of the child. For example Joseph (1999, p. 193) in a review of the literature reported that:

> [I]n several well known studies of children raised in foundling homes during the early 1900s, when the need for emotional contact was not well recognized, morbidity rates for children less than 1 year of age was generally over 70%. Of 10,272 children admitted to the Dublin Foundling home during a single 25 year period, only 45 survived. Children who survive an infancy spent in institutions where mothering and contact comfort were minimized, display low intelligence, extreme passivity, apathy, severe attentional deficits, pathological shyness, and exceedingly bizarre social behavior.

An oft-cited study by Spitz (1945) gives a strikingly similar account. This study detailed how over 100 children reared in a foundling home with minimal stimulation spent their time obsessively engaged in strange self-stimulatory behaviours and strenuously blocking all adult attempts to interact with them by incessant crying.

I have had personal experience of this phenomenon. It occurred when I started working with an eight-month-old baby girl whom I will call Janine. Janine was both deaf and blind. She was the only child of young parents who lived a long way away from their own parents. I was briefed that Janine had been left to spend most of her time unstimulated and alone in her cot. Her mum said she ‘was no trouble at all’ and she ‘preferred to be left alone’. So Janine had slept often more than twenty hours a day.

Neither mum nor dad had yet bonded with Janine. She was not breastfed. Before coming home from hospital Janine had been in a humidicrib and was already sleeping for long periods of time. By the time she came home, she did not seem to like being handled. When her parents looked at Janine she did not look back so there was no eye contact and when they talked to Janine she did not respond so there was no conversational contact either. Over the ensuing weeks they gave up and let her be, feeding and changing her but little else.
It took me six weeks of visits and working with the parents before I was able to even start to engage with Janine. During those first six weeks every time I tried to pick Janine up she would vehemently scream in protest and nothing I did would dissuade her. It was the same for both her parents. At the time I remember reflecting on Rene Spitz’s research and wondering whether Janine’s sensory deprivation was simply a result of neglect and lack of know-how, or whether her dual impairments had somehow substantially intensified the deprivation.

As soon as we made our first breakthrough in week six and Janine stopped crying we began a campaign of multisensory stimulation and her resistant behaviour gradually started to abate. Once I was able to demonstrate to the parents that Janine would not protest at being held we purchased a child carrier and the multisensory stimulation began in earnest. The key was convincing mum and dad to use the papoose to keep Janine near them as often as possible, a radical change to their previous behaviour. Fortunately they started to involve Janine in everything they were doing and the changes in Janine’s behaviour provided its own reward.

But this type of early intervention does not always happen. Perry and Pollard (1997) published a disturbing picture of two brain scans of three-year-old children, one of a typical child and the other of a child who had been subjected to extreme sensory deprivation. The scan of the child who had been neglected shows a brain with significant cortical atrophy (withering) within a much smaller head. Clearly lack of sensory stimulation through global neglect, deprivations to many different domains, has a substantial effect on the developing brain. Furthermore recent research into neuroplasticity indicates that profound lack of sensory stimulation over an extended period of time has a consequent negative effect on all human brains, no matter what age the person is.

Sometimes sensory deprivation is deliberate and horrific. For example Koluchova (1972, 1976) reported on a pair of identical twin boys from Czechoslovakia. Their mother died soon after their birth so they were placed in social care for about twelve months and then looked after for a further six months by a maternal aunt. During this time their development was normal. When their father, who travelled a lot, remarried, the twins came to live with a cruel stepmother who, for the next five years, kept them in a dark cellar, fed them with meagre scraps and beat them regularly. When discovered the seven-year-old twins were very small, could not speak, had rickets, were afraid of people and were assessed as having severe, permanent, physical and intellectual disabilities.

Surprisingly the twins made an unanticipated recovery. They were enrolled in a special school for children with profound learning disabilities and adopted by a particularly proactive woman who oversaw a programme of stimulation and education. By age fourteen the boys had caught up with their same-age peers and were assessed as being within the normal range both scholastically and emotionally. They went on live stable productive lives. Both married, had children of their own and held down responsible jobs.
When this story was published it sent shock waves around the medical, psychology and education worlds because it radically challenged the assumption of the brain's immutability. Prior to this time emphasis had been placed on the idea of essential critical stages of development within a specific timeframe. This idea was challenged by the fact that these two boys were able to catch up to their same-age peers. The human brain has an amazing ability of self-repair, providing the right conditions for this repair are provided. Subsequent literature started to be much more cautious with the way it discussed critical stages of development.

**Early sensory stimulation approaches**

Sensory deprivation not only occurs from abuse or neglect, it is also caused by severe sense impairment and learning disabilities. Because of this our society has a moral responsibility to try to minimise sensory deprivation in children and adults with sense impairment and learning disabilities. Despite the horror stories associated with sensory deprivation there are examples where practitioners have tried to provide sensory stimulation to people who might otherwise be sensorially deprived. For example Cleland and Clark (1966, p. 213), two psychologists who worked in the USA, developed a 'sensory cafeteria' for people with intellectual disability who lived in an institution to reduce their abnormal behaviour.

A few years later, in the early 1970s, Hulsegge and Verheul created a similar sensory approach to keep the 440 participants with intellectual and multiple disabilities at the De Hartenberg Centre in the Netherlands gainfully occupied. Hulsegge and Verheul called their areas for sensory stimulation a Snoezelen, a word they created by combining the Dutch words: "'snuffelin' = to sniff, to snuffle and "doezelen" = to doze, to snooze" (Verheul 2007, p. 8).

As the story goes, one evening after work Ad Verheul and Jan Hulsegge had a social get together, where they started talking about what a pity it was their participants never got to experience simple social pleasures such as going to the pub. They discussed how life for their participants was always the same, always predictable, with very little change, very little to occupy them. They wondered whether there was anything they could do about it. After more discussion they decided to conduct an experiment, so they went back to the centre and found a participant who was just sitting in a wheelchair doing nothing, seemingly completely disengaged. They wheeled him out into the cool evening air for a few minutes, then wheeled him back inside. His reaction was one of sheer delight. He started laughing and interacting in ways that were surprising – out of character. Something had happened that caught his attention – he became engaged.

Inside the building was always kept at a constant temperature, whereas outside it was cool. Ad and Jan believed that it was the change in temperature that made the difference. This inspired Ad and Jan and other staff at the centre to design a
series of rooms to create a ‘dream atmosphere’, which provided ‘stimuli for every sense’ (Verheul 2007, p. 16), and was very different to their day-to-day life in the institution. They told their story in a book entitled *Snoezelen another world: a practical book of sensory experience environments for the mentally handicapped* (Hulsegge and Verheul 1986).

Once their book was published, similar rooms for children and adults with sensory and learning disabilities were constructed in different locations throughout Europe and around the world. Within a fairly short period of time the word Snoezelen® had become a registered trademark for the British company ROMPA, so new terms and approaches to multisensory stimulation began to appear such as multisensory environments, controlled multisensory environments, multisensory rooms, sensory trolleys and sensory theatre to name but a few.

Multisensory stimulation refers to information that simultaneously appeals to more than one set of sense nerve receptors. It is this synchronized alliance of the senses that creates entirely new abilities or ways of gaining information about the world that would not be possible through one sense organ alone. The key message is that the more multisensory the stimulation, the more likely the information will be perceived in accurate, valid and dependable ways. The idea of us using a particular sense in isolation is somewhat illusory. We are multisensory beings – our senses work in concert with each other, even when we think they are operating in seclusion. Therefore using multisensory stimulation to help children and adults with sensory and learning disabilities is a most natural, logical and optimistic approach.