A Whole Body,
Kinaesthetic Digital Drawing Tool for Art Therapy

by
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Abstract

This study is to explore the likelihood of a kinaesthetic user interface and algorithmically generated drawing tool to serve as an effective tool in art therapy. The author has assumed increasing the range of physical movement to full body can allow patients to reveal information about their mental and psychological state, which is to help achieve therapeutic goals. Based on this premise and the improvement upon current digital devices, a motion-sensing drawing tool has been created based on research findings to validate the impact of drawing and whole body movement on art therapy. With corroboration from research findings and artefacts, validated data were collected from art therapy practitioners and further analysed. The results indicate this tool can aid therapists’ achieving therapeutic goals by facilitating clients to express creatively. The clients who can benefit from this tool include people prone to impaired verbal communication and people with physical disabilities or emotional problems.

Keywords: Art therapy; Movement; Human Computer Interaction; Expression; Observation; Gestural Systems;
Dedication

Dedicate to this imperfect world, with love.
Acknowledgements

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As always, I assume alone the full responsibility for all the remaining errors or shortcomings of this thesis.
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# List of Acronyms and Glossary

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<th>Term</th>
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<td><strong>Body orientation</strong></td>
<td>The posture of two people facing each other or sitting or standing side by side.</td>
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<td><strong>Divergence design</strong></td>
<td>Exploring possibilities and constraints of inherent situations by applying critical thinking toward better design solutions.</td>
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<tr>
<td><strong>Dyadic</strong></td>
<td>Something that consists of two elements or parts; binary relations.</td>
</tr>
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<td><strong>Embodiment</strong></td>
<td>The representation or expression of something in a tangible or visible form.</td>
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<td><strong>Expressive therapy</strong></td>
<td>Expressive therapy uses creative arts such as music, dance, drama, and writing as a form of therapy.</td>
</tr>
<tr>
<td><strong>Flow state</strong></td>
<td>Flow is the mental state of operation in which a person in an activity is fully immersed in a feeling of energized focus.</td>
</tr>
<tr>
<td><strong>GUI</strong></td>
<td>Graphic User Interface</td>
</tr>
<tr>
<td><strong>HCI</strong></td>
<td>Human Computer Interaction</td>
</tr>
<tr>
<td><strong>Kinaesthetic</strong></td>
<td>Mediating end organs located in muscles, tendons, and joints and stimulate bodily movements and tensions. Origin: late 19th century: from Greek <em>kinein</em> 'to move' + <em>aisthēsis</em> 'sensation'.</td>
</tr>
<tr>
<td><strong>Postural congruency</strong></td>
<td>The state when two people's body positions are identical.</td>
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Chapter 1.

Introduction

Human beings resort to various ways to express their notion of ‘self’. When inhibited from speaking freely or directly what they think or feel, they may choose a creative form to reveal their inner reality, depending on what medium they feel comfortable with (C. A. Malchiodi, 2011). Music, drama, painting and many other art forms could be one of the choices.

Drawing is often singled out by art therapists as a common intervention for it is a less threatening way for people to express themselves (Malchiodi, 2006). Especially for clients with inner trauma, it could be difficult for them to use words to recount their experience. For this reason, drawing plays a mediation role between art therapists and clients in a triangulate relation. By drawing, people can enhance self-expression and self-esteem (Rees, 1998). The action of drawing is more related to right brain activities, which aid clients to release emotions and develop creativity. In the process of drawing, clients are able to explore their experience-related feelings and further liberate the repressed emotion (Malchiodi, 2012). In addition, drawing have great potential to maintain a stable mental state in art therapy session because through therapeutic art-making can facilitate integrating left and right hemispheres (Hass-cohen, 2008).

More, drawing itself is a symbolic representation of people’s thoughts and experiences. A drawing can contain messages of emotions, cognition, expression of hidden traumas and ambiguous or contradictory feelings. Thus, drawing reflects people’s inner reality with visual elements, such as lines, colours and composition. These symbolic graphics can reveal the relationship between the client and the world around him (Kossolapow, 2006).

Apart from using art media to express the unspeakable feelings or thoughts, body movement can also serve an outlet for one’s inner feelings, as remarked dance
movement therapist Stanton-Jones, “Use movement experimentation to explore new ways of being and feeling and to gain access to the feelings that can’t be verbalized” (Stanton-Jones, 1992, p. 3). The fundamental principle underpinning the movement therapy is that human body and mind are primordially connected (Halprin, 2008a). Therefore, there is an inseparable interplay between physique, emotion and cognition. For instance, a simple gesture can contain meaning, emotion, behaviour and memory. Hence, movement can be a metaphor for therapists to access clients’ psychological state.

Among all media to channel emotions or deliver messages, drawing may be the most illuminating one, not only because a person’s state of mind could be translated into visual image, but also for the fact that drawing itself is a trajectory of body movement (Matthews, 1984). Whether the act of drawing is conscious, unconscious, or even involuntary, it involves an action of executing an artwork and hand-and-arm movement to manipulate a medium, which, like any corporal movement, also contributes to the drawer’s self-expression. Nevertheless, normal art therapy sessions only involve movement from fingertips to arm in the sitting posture due to the convention of art or convention of art materials. As a result, clients are hardly ever required to engage whole body movement in the drawing process. To compensate for the neglected physical movement in drawing, this thesis suggests that both the product of drawing (the accomplished piece of artwork) and the process (the act of drawing) are essential to art therapists’ interpretation of their clients’ physical, mental and psychological state.

Today, digital media and their applications are ubiquitous. Using digital media has become inseparable from our work and life. This is still not the case in art therapy, yet there are signs indicating digital media can be an effective device to art therapists. Some contemporary art therapists like Poole (Ginger, 2011) are attempting to use digital media and touch devices for creating digital drawings in therapy sessions. In Thong’s study (Thong, 2007, pp. 52–58), he claimed that applying computer-generated art is a valid modality for empowering clients and fostering the therapeutic alliance between therapists and clients.

However, common contemporary digital drawing input devices, such as mouse and tablet, only allow users to draw with limited body movement, mainly just finger or
most digital drawing designs seem to neglect the fact that body movement can help reveal or articulate one’s inner feelings. Even though there are digital Motion-Sensing drawing tools, they are designed primarily for art and design purposes (Hamilton, Lin, & Kerne, 2011; Scheible & Ojala, 2009) such as 3D paintings, 3D sculpture, installation and performance. The only exception is Krueger’s Metaplay (1970), an installation allowing users to interact with computer in real time with visual and sound response. Krueger’s works have great impact in the realm of virtual reality and augmented reality. He also predicted the great potential of employing virtual space in the field of psychotherapy (Krueger, 1991).

Research Approaches and Contributions

This thesis implements and evaluates integrating whole body movement with computationally adaptive art creation to propose new methods of art therapy. The central contribution of this thesis is as follows:

1. Based on the assumption that the whole body movement can help enhance a client’s ability to express creatively, the author aims to explore the concept of integrating whole body movement and art creation into the digital drawing interaction. The research delves into the field of expressive movement and field of motion-sensing technology to fulfill the need of updating current technology in art therapy practice.

2. In order to corroborate the hypothesis and achieve the aforementioned goals, the author has created motion-sensing drawing tools to fulfill certain needs of art therapy practice. The author further designed the whole body, kinaesthetic drawing prototypes in an iterated process for providing an alternative option to art therapists to achieve therapeutic goals through creative expression.

3. Based on the applications of the prototype, the author has categorized possible design features into an understandable matrix of parameters. The matrix proposes a vocabulary bank regarding design features used for whole body-based art therapy to
both art therapists and digital interaction researchers. The vocabulary and grammar
given in this matrix have been developed and iterated and further validated by art
therapy specialists and practitioners. It is expected through acquisition of this design
language, both art therapists and interaction design specialists can establish a common
knowledge framework. Furthermore, with the shared common grounds, both parties can
predict the potential applications, discover new design features and create new
treatments for clients.

4. Other contributions of this research include a qualitative study to evaluate the
effectiveness of the tool for future art therapy procedures, and proposed user scenarios
developed by art therapists. To gather reliable research findings, the author presented
the artefacts and matrix framework of design features to art therapy experts. The study
includes two demonstrations and seven expert interviews in a qualitative approach. The
author illustrated and verified the design knowledge and vocabulary with the art therapy
practitioners and further investigated how the whole body movement can enhance
therapeutic goals. At the same time, certain key questions were posed to the experts.
For instance, which demographic groups can benefit from this drawing device? What are
the advantages and disadvantages of a motion-sensing tool? The ultimate goal of this
study is to find out how contemporary art therapists can benefit from such a tool in their
practice.

**Novel Properties**

According to the results from the qualitative study, the author emphasised the following
properties of this kinaesthetic drawing system:

1. The design is equipped with the dual features of controllability and flexibility for art
therapists to apply constraints and freedom in the drawing process. Through adjusting
the digital parameters, the system is able to aid art therapists in attaining specific
therapeutic goals.
2. This drawing system can be used for a wide range of user scenarios. By engaging their whole body movement in an interactive drawing process, users can actively release intense emotions, reveal inner feelings, increase the capacity to reach trauma in a cellular level, engender the connection between body and mind.

3. The system emphasises the drawing process as much as the final product. Thus, users can express themselves creatively through both the process and the product. As a result, therapists can gain more relevant data and, better still, retrace and record the process.

**Thesis Organization**

This thesis is organized in the order as follows: Chapter 2 reviews the background knowledge of theory and practice of art therapy and expressive movement, and further reviews contemporary computational art tools in the art therapy practice and investigates current motion-sensing drawing techniques. In Chapter 3, the author presents three major research goals of the research and explains the methodologies used to accomplish the tasks. Chapter 4 documents the details of exploration design process, which includes devising three prototypes and a design matrix framework. It also demonstrates all the possible design features of motion-sensing drawing tool and the design features of prototypes. Chapter 5 covers a qualitative study to verify the usage of this kinaesthetic drawing tool. The study involves procedures of the tasks, participants, hypotheses and results. Chapter 6 concludes the benefits of applying this drawing device in art therapy practice and further lays out the follow-ups to the potential future research.
Chapter 2.

Literature Review

2.1 Healing through Art

2.1.1 Overview of Art Therapy

For centuries, art has been considered an instrument for self-expression, communication and interaction between individuals and groups. Sound, texts and image are employed to capture humans’ inexpressible feelings and memories in order to achieve therapeutic goals. The beginning of art therapy can be traced back to cave paintings (C. A. Malchiodi, 2006). The then artists believed these cave paintings could prevent hurt from wild animals, hazardous environment and unpredictable forces. As to the healing power of art, some aboriginal tribal cultures utilize art to release stress and cure diseases. For example, the North American Indian Navajo’s spiritual healing system blends dancing, singing and sand drawing to induce healing. Other cultures have employed symbolic visual images as a medium to record daily life, special events or religious rituals.

Today, the discipline of Art Therapy combines both art and psychotherapy. It is a relatively new area compared to traditional psychology. According to the American Art Therapy Association, “Art therapy is a mental health profession that uses the creative process of art making to improve and enhance the physical, mental and emotional well-being of individuals of all ages. It is based on the belief that the creative process involved in artistic self-expression helps people to resolve conflicts and problems, develop interpersonal skills, manage behaviour, reduce stress, increase self-esteem and self-awareness, and achieve insight” (“AATA About Us,” 2011).
In the therapy session, art therapists and clients are able to communicate through symbolic visual image. By tapping in on creative art making, clients could express themselves. These characteristics of art making are not different than the ancient cave painting. Nevertheless, comparing contemporary art therapy to cave painting or religious rituals, the major difference is the guidance from professional art therapists. Instead of believing in super natural or superstition, art therapists aid clients to reveal their inner world in a harmless objective way.

In view of the development of psychology, it should be fair to say Sigmund Freud’s interpretation of dreams is the first theory that has combined psychology and visual images (Benson, 1994). Later, drawing on his personal interest in art, Swiss psychiatrist Carl Jung postulates that raising the repressed unconsciousness to the consciousness level through art making could help maintain people’s mental health. Because of these precursors’ acclamation of the influence of visual art and images on mental health, more and more psychologists began utilizing art making to restore balance back to their clients suffering from mental disorder.

One of the earliest pioneers of art therapy in North America is Margaret Naumburg, often referred to as the founder of art therapy in the United States. She is the first person clearly outlining the nature of art therapy. In 1940, she established “Psychodynamic Art Therapy” (Naumburg, 1987). Under the influence of Freud and Jung, Naumburg put forward the theory that art making therapy technique is equivalent to verbal therapy technique and has the natural evocative power to release unexpressed thoughts and emotions. She believes the process of art therapy should focus on identifying a person’s fundamental feelings and thoughts in pictures instead of words.

By late 1940s, Naumburg’s model of art therapy evolved into releasing the unconscious by means of spontaneous art expression. It is noteworthy that around the same time, the American painter Jason Pollock had utilized spontaneous unconscious art expression to create his drip paintings/action paintings. Pollock mentioned, "When I am in my painting, I'm not aware of what I'm doing. It is only after a sort of 'get acquainted' period that I see what I have been about… because the painting has a life of its own. I try to let it come through." (Karmel, 2000, p. 18).
Naumburg thought by encouraging clients to release their unconscious mind, it could enhance the transference between patients and therapists. In addition, she also believes that when symbolic aspects of imagery, words and cognitive experience are recognized throughout an art therapy session, an integrative and healing opportunity will ensue (Naumburg, 1987).

Concurrently, other than Naumburg’s pioneer theories in art therapy, another U.S. art therapy forerunner, Edith Kramer took an alternative path to combine art and psychology. Kramer emphasizes that the value of art therapy is to rely on the process of art making itself. She coined the phrase “Art as therapy” (Kramer, 2001) which in contemporary terms could be rephrased as “Art as healing process” (Malchiodi, 2006).

In brief, art therapy can be defined from three viewpoints. The first views creative impulse as an instinct. For instance, Donald Winnicott, an English paediatrician and psychoanalyst, has enriched the realm of art and literature by a new way of looking at creativity. He believes that the creative impulse is a basic instinct inherent in every human being. As he illustrated the creative impulse can be seen as “a thing in itself” (Winnicott, 2005, p. 69). From Naumburg comes the theory that a spontaneous creative impulse can be a natural evocative power to unlock repressed thoughts and feelings. The second theory holds that the ability to heal is essential to the creative process of art. The process of creating art itself will lead to healing. In other words, the treatment is the cure itself. The third perspective is that the art experience is crucial to self knowledge and postulated that self knowledge brings about healing (Jung, 1989). The bridge between art therapists and clients is based on the idea that art is a medium of symbolic communication. In 1969, the America Art Therapy Association was established. In 1970s and 1980s, universities in the United States began to offer art therapy degrees, which resulted in the considerable increase in the number of therapists adopting art as a healing tool. The art therapists then emphasized the healing power of art and encouraged clients to express their thoughts and emotions in a safe creative environment. Today, art therapy is being applied to a wide variety of clients subject to emotional, behavioural or mental health problems, learning disabilities or physical problems, etc. The goal of art therapy is to encourage clients to overcome inner trauma, increase self-esteem and gain self-awareness. Consequently, clients will be able to have
better relations with others and develop better strategies or skills to resolve conflicts in life.

With development of their profession, art therapists became partners with other medical professionals such as psychologists in mental health centres and medical centres. They also cooperate with various institutions offering psychotherapy services such as community service, prisons, schools, rehabilitation centres, cancer centres, etc. Because of their increasing profile in society, and the growing acceptance by the general population, today’s art therapists can be certified by the government after passing an exam. An art therapy certificate not only provides credibility to the profession, but also has made health insurance companies willing to include art therapy in policy coverage.

Furthermore, art therapy has integrated with other therapies in recent years in order to increase its effectiveness. Integrating with dancing therapy, music therapy and play therapy, art therapy has increasingly enriched its techniques. Art therapy could become even more creative and diversified.

Even though theories and practice of art therapy vary from one therapist to another, Dr. Judith Rubin, a 40-year veteran in art therapy, succeeds in summarizing the common features as follows (Rubin, 2001).

1. Emphasis on nonverbal communication
2. Emphasis on the creative process
3. Building a safe and trusted environment to let clients freely express feeling, emotion and cognition
4. Utilize an art medium to reflect a client’s emotion. Through an understanding and supporting process let a client explore potential sources of problems
5. Therapist is able to lead client to achieve a therapeutic goal

With these common features, theory and practice work side by side to provide a great opportunity for clients to mend themselves by creative art making. Throughout the history of art therapy in North America, art therapy is divided into two main interpretations. The first interpretation is ‘Art Psychotherapy’, posited by Margaret
Naumburg. She believed that applying art in psychotherapy can help release negative feelings and solve inner conflicts. She also claims that art is a symbolic language. Art therapists and clients can use this nonverbal medium to improve transference. The second interpretation is ‘Art as therapy’, suggested by Edith Kramer (2000). Kramer believed that the process of art making can ease clients’ emotions, resolve conflict and enhance self-awareness.

The difference between the Naumburg and Karmar interpretations is that Naumburg emphasized analysing and interpreting the artwork. She considered art making only part of the healing process. On the contrary, Karmar emphasized the process of art making is the entire healing process. Thus when the process of art making is completed, the healing is completed. Even though both Naumburg and Karmar have different visions of art therapy, they both agreed that art therapy should be based on understanding and respect toward clients. The intent is to aid clients in therapy sessions by building a trusting relationship and providing a safe environment. Instead of focusing on training clients to become an artist, art therapy should focus on disclosing and interpreting a client’s inner reality through visual image.

Based on Naumburg’s and Karmar’s theories, the practice of art therapy can be categorized as two models, studio-based art therapy and directive-based art therapy.

Studio-based art therapy is derived from Kramar’s ‘Art as therapy’, of which therapist Pat Allen’s (Allen, 1995) open studio project can be a typical example. The open studio project suggests everyone is an artist. No one is a better one than others. As a result, in art no one can be considered authority. There is a vital “No Comment” rule in the process of drawing. Art therapists play the role as facilitator to assist clients to make art freely in a healthy environment. In the usual studio-setting therapy sessions, there is a wide variety of art materials for clients to use to release the tension of emotions, explore their self-image and reveal their inner reality.

On the other hand, directive-based art therapy is influenced by Naumburg’s ‘Art psychotherapy’. The art therapist plays a leading role in the creative process. He or she will set objective goals and design treatments, depending on the diagnosis of each individual case. Clients will create artwork following certain topics and using the kinds of
materials designated by the therapists. The interaction between the therapist and client is guided by the therapist to help clarify clients’ inner voice and therapists’ interpreting.

Among all the directive-based art therapy theories, *Expressive Therapies Continuum* (ETC) is the most sophisticated one. It is a multileveled conceptual model created by Kagin and Lusebrink (Kagin & Lusebrink, 1978). ETC provides a framework for continued transformation of feelings, and the development of expression and modalities in the therapeutic practice. ETC theory has influenced how art therapists choose art materials and give client direction. The basics of ETC contained four different levels in rank order from bottom to top as follows: the Kinesthetic/Sensory (K /S) level, the Perceptual/Affective (P/A) level, the Cognitive/Symbolic level and the Creative (CR) level. These levels are divided according to complexity of emotion and cognition development. The creative level, combining the expressions from the other three levels, is ranked the first order of all.

![Figure 1. Schematic representation of the Expressive Therapies Continuum.](image)


Each level contains its own healing dimension and focus. Moreover, each level is constituted by two components, which can enhance or decrease the ability pertaining to the other levels.

For example, Kinaesthetic and Sensory could enhance each other, yet a complete focus on the kinaesthetic level might result in diminishing the awareness of the sensory level. The characteristics of respective levels also depend on various Reflective distances. Lusebrink (1990) describes Reflective distance as “A reflective distance that denotes the time span between the impulse or stimulus and reaction to it. The Reflective distance increases with the consecutively higher levels of the ETC from the Kinesthetic to the perceptual and cognitive components.”
This ETC framework provides art therapists a systematic way to design treatment and choose art media based on an individual client’s needs. Art therapists cannot only lead clients through various levels up and down but also can lead clients to experience the flow state between two basic components in each level. By observing the interaction between a client and a medium, an art therapist can evaluate a client’s mental state and further uncover a client’s inner voice.

**Kinesthetic / Sensory level** mainly focuses on releasing energy and expressing state-of-mind through spontaneous body movements. By utilizing various gestures and motions, the client lifts up the unconscious mind via a process of exploring a variety of art materials. The sensory part emphasises inner sensations as well as other sensations such as tactile, audio, visual and visceral, triggered by external stimulation. Sensory involvement might include putting one’s self into an unpredictable sensory activity without conscious control. Thus, in general, the sensory images created at this level are below the level of consciousness. For instance, Jason Pollock’s action paintings can be categorized at this level.

The art medium at this level plays the role of facilitator to enhance body movement and sensations. The reflective distance is minimal in the K/S level. It means that the time between stimulation and body response is very short. When a client punches clay, he or she can feel the tactical sensation and body movement through the punching. In this case, the role of the clay is to generate consciousness and kinaesthesia by coordinating movement and sensation. Art making like scribbling and punching clay are typical forms pertaining to the kinesthetic level. An activity like finger painting is a typical form related to the sensory level.

The **Perceptual / Affective level** focuses on the formation of schematic and representative images, such as patterns and shapes. The P/A level emphasises the structure of images and the quality of structure using various media. The affective component focuses on the conversation between the different media and individual expression. Images can be revealed and transformed out of the intense effects generated from repressed feelings and memories. In this level the reflective distance can vary from minimal to extensive depending on the type of focus. When clients over-focus on the rationale behind the images in the perceptual level, the reflective distance is
extensive. On the other hand, when clients focus on the affective component, the reflective distance is short.

In art therapy, the perception component emphasises the composition of shapes, colours and patterns. For example, using a resistive medium can stimulate a client’s awareness of figures and shapes more effectively than using a fluid medium, as it is more difficult to control shapes and images by using the latter like watercolour.

In the affective level, a client focuses on techniques and styles with dynamic art media, such as intensive colours as fluid medium can enhance the expression of effect. The main healing dimension focuses on the interaction of schemes and the formation of symbolic images.

**Cognitive / Symbolic level** emphasises verbally analysing the images related to personal experiences. Accordingly, this level is different from previous levels in a qualitative way. The cognition component focuses on logical thinking and rational analysis. It refers to how to motivation, problem-solving and decision-making abilities. By utilizing different models or media, a therapist can help his/her client to reassess problems and build structured solutions. The symbolic level focuses on metaphorical expressions, which appeal to the intuition, but can co-exist with kinaesthetic, affective levels. Because of its focus on quality over quantity, the reflective distance of the C/S level is longer than those are required at the aforementioned levels.

In an art therapy session, a client might be asked to solve problems and complete assigned tasks in the C/S level based on their personal experiences and reactions toward the experiences. For instance, a collage could be used in this level because it involves selecting images, recomposing images or using mixing texts with images. An art therapist might ask a client to create a theme by collage (e.g., illustrating your strengths and weaknesses). In C/S level, media serve to extract symbolic elements from the expression of concrete images. The healing dimension in this level is discovering new or repressed parts of self by solving problems through verbal and visual integration.

The Creative level is a synthesis of expressions across all levels. Consequently, it can be found in the Kinaesthetic/ Sensory level, the Perception/ Affective level and the
Cognition/ Symbolic level. It is important for art therapists to encourage clients to be creative. Providing an appropriate treatment and safe environment, therapists can induce clients to open their heart to themselves and enjoy the stimulation of the art making process. Furthermore, clients gain joy and satisfaction by exploring a new level of expression and self-awareness.

2.1.2 Art Therapy Practice

According to a recent survey on the workforce of Art Therapy in Canada, published by “CATA National Survey 2009-2010,” (A. Lee, 2011), most Canadian art therapists are between 46 to 50 years old with 6 to 10 years of clinical experience. The majority of the practising art therapists are currently residing in British Columbia, Ontario and Quebec. In Canada, art therapists work in a very wide variety of settings, ranging from private clinics to non-profit agencies. Most art therapists hold a bachelor degree and one fifth hold a Masters or PhD. Nevertheless only half of the population work in full time positions. On the client side, the age range includes adults, children, adolescents and seniors according to the size scale from largest to smallest. The types of clients art therapists mostly work with are those who are subject to emotional and behavioural disorder.

Art therapy can be a particularly useful treatment tool for people who have difficulty expressing feeling in words. For instance, children often have limited language and communications skills. By drawing or visually expressing their feelings, even if they cannot identify or articulate their emotions, younger patients have a starting point from which to address issues. Art therapy is also valuable for adolescents and adults who are unable or unwilling to verbalize thoughts and feelings.

Beyond its use in mental health treatment, art therapy is also employed as an adjunct therapy to traditional medicine for the treatment of biologically-based diseases and disorders. The correlation between mental health and physical health is well recorded by drawing process. Art therapy has been used in the healing process to relieve stress and develop coping mechanisms, in an effort to respond to both the physical and mental needs of the patient. Since art making activities involve doing, feeling and thinking, art therapy can bring great benefit to clients. The benefits are summarized by Liebmann (Liebmann, 1989, p. 13):
1. Almost everyone has used art as a child, and can still do if encouraged to forget about images having to be “artistically or culturally correct”. It can be used as a means of self-expression and self-exploration. Not only feelings may be explored, but also thoughts, ideas and possible behaviour. It can sometimes be a good way of cutting through ‘tangled verbosity’.

2. It can be used as a means of pre-verbal or non-verbal communication, as a means of symbolic speech. Pictures can act as a bridge between the art therapist and client, especially where the subject matter is too embarrassing to be addressed, or implies negative connotations for the client. In a psychotherapeutic setting, the picture may be where the transference takes place.

3. The process of doing art can sometimes help people become more aware of feelings previously hidden from them, or of which they were only partly aware. Using art can sometimes help people to release feelings e.g. anger and aggression, and can provide a safe and acceptable way of dealing with unacceptable emotions.

4. The ‘framed experience’ can provide a context parallel to ‘real life’, encourage patients to rehearse or fantasise about possible futures, without any commitment to the reality.

5. The concreteness of the products makes it easier to develop a dialogue between art therapists and patients.

6. Discussion of the products can lead to explorations of important issues. Pictures are often ambiguous, and the most important thing is for the creator to find his or her own meanings.

7. Art therapy can provide an ‘enabling space’ in which individuals can use art materials to explore themselves without pressure. It can be an opportunity to allow adults to ‘play’.

8. Using art requires active participation, which can help to mobilise people

9. For certain disorders, art therapy can be used for diagnosis, e.g. stroke patients with speech disorder

Despite the multitude of beneficial effects and wide application in treatment, not all art therapy treatments are successful. In fact, success often depends on the therapists’ relationship with their clients and treatment designs. It is important for an art therapist to be a good listener, observer and interpreter in a therapy session
A supportive relationship and a safe protective environment can make art happen in a therapy session. When clients are projecting their negative feeling with symbolic images, they are also attempting to avoid direct harm from verbal language or behaviour. Art, as a nonverbal medium, has great potential to help patients disclose constrained subconscious content. Art therapists and clients can establish a quality conversation starting from interpreting visual images (Malchiodi, 2011). Thus, art therapists and clients actually form a triangular relationship in a therapy session. By interpreting and communicating this visual journey the art therapist is able to help patients bring balance back into the patient’s inner reality.

The triangular relationship has developed two schools of art therapy. The Studio-Based art therapy focuses more on the interaction between art and clients with the emphasis on art as healing. Based on Karmar’s theory, Studio-Based art therapists believe that art making has the ability to heal and reveal the inner world in symbolic images. Therefore, verbal communication is not as important as the process of being creative, whereas Directive-based art therapy focuses on the interaction between art therapists and clients more than Studio-Based art therapy does. Directive-based art therapy suggests the client/therapist interaction facilitate a client’s ability to think and further explore through art making. It usually requires clients to create art using specific art media and themes. This process is more related to ‘art psychotherapy’.

For both schools of art therapy, clients do not have to be equipped with any art training or aesthetic concepts in an art therapy session. The underlying nature of art therapy is to emphasize the process of exploration of inner reality rather than how presentable the final artwork is. Instead of faithfully depicting what they see in front of
them, clients experience emotion, memory and cognition more fully by depicting their inner reality. Thus art therapists do not criticize drawing techniques or composition skills.

In fact, art therapy can be more than just a cerebral experience. Human emotional experiences can also be embedded in the human body. “Highly charged emotional experiences such as trauma are encoded by the limbic system as a form of sensory reality.” (Malchiodi, 2008, p. 15). To solve problems of complex human emotion, art therapists can not only deal with patients’ feelings, doing and thinking, but they also need to acknowledge the process of art making involves whole body interaction and multimodalities. As Machiodi described “Action-oriented activities can tap the limb system’s sensory memory of the event and help bridge implicit and explicit memories of it.” (Malchiodi, 2008, p. 15).

In the previous section, the researcher reviewed a Canada national art therapy survey to understand the current state of art therapy practice in the country. Art therapy is a psychological treatment for people who have difficulty expressing themselves verbally. The researcher investigated how the process of art making can aid a client’s physical being, emotional being, and mental being in a therapy session by reviewing Liebmann’s summaries. By clarifying the relationship between art, art therapists and client, it is easier to understand how visual images work as nonverbal communication and how art therapy can help overcome inner trauma. In order to further comprehend the role played by media in art therapy, the researcher will explore the theory of Media Dimension Variables and investigate the usage of digital art tools in art therapy practice.

2.1.3 Art Therapy Medium

Medium plays a significant role in art therapy practice. It not only stores a client’s feelings, memory and thinking in visual form but also allows clients to transfer emotion and cognition through interaction. Each medium has its own inherent properties that will resonate with a client’s psychological state during the creative process. Betensky describes materials as “Live participants in the process of self-expression, acting upon the art makers” (Lusebrink et al., 1982, p.112). Furthermore, Betensky (2001) postulates that materials can help clients connect with the external world because materials are substances that come from the environment. With the ability to create a dynamic process between inner experience and the external world, choosing the right
medium for clients is essential for art therapists as the medium can work as a mirror to reflect a client’s inner mental experience and provides clients with a window to connect external world with personal meaning.

The most common framework used by art therapists to choose appropriate art materials is the Media Dimension Variables (Lusebrink, 1990). It is based on the ETC psychodynamic model where the characteristics of each medium are connected to psychological functions. Kagin and Lusebrink have categorized various characteristics of art medium into three main components: fluid or resistive; simple or complex; and structured or unstructured. Art therapists have to select appropriate art materials by discerning the difference between materials. For example, water colour and tempera can be too complex for handicapped and developmentally delayed clients.

![Figure 3. The Media Dimension Variables](image)

The fluid / resistive component of Media Dimension Variables theory, distinguishes art materials which have more of the quality of a fluid, such as watercolour and the paint, as opposed to the materials that have a more resistive quality such as markers and coloured pencils (Lusebrink, 1990). In addition, fluid materials can be characterized by their ability to mix and blend with other material properties. A fluid medium is not necessarily a liquid. For example, although chalk pastel is in solid form, users can easily use it to blend colours and rub the chalk powder smoothly on the paper, so it is still considered fluid despite the fact it is in solid form.

The simple/complex component emphasises the complexity of the art material that is being used (Lusebrink, 1990). In general, an art material can be classified as a simple medium if using it involves one or two operations. Coloured pencils and crayons belong to simple media. On the other hand, collages, wood carving and oil painting can
be classified as complex media. Utilizing complex art materials often involves more functions at the cognitive and symbolic level.

The last part of Media Dimension Variables is structured/ unstructured component. It deals with the relation between a medium and the art therapist’s directive treatment. For instance, clay can be an unstructured medium when an art therapist asks a client to create some work spontaneously. However, when an art therapist asks a client to create a specific topic with clay, clay is considered a structured medium.

<table>
<thead>
<tr>
<th>C/S</th>
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<th>F/R</th>
<th>Example</th>
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<tbody>
<tr>
<td>Complex</td>
<td>Unstructured</td>
<td>Fluid</td>
<td>Painting in studio based art therapy</td>
</tr>
<tr>
<td>Simple</td>
<td>Unstructured</td>
<td>Fluid</td>
<td>Dripping paint in studio based art therapy</td>
</tr>
<tr>
<td>Complex</td>
<td>Structured</td>
<td>Fluid</td>
<td>Painting and collage in directive art therapy</td>
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<tr>
<td>Simple</td>
<td>Structured</td>
<td>Fluid</td>
<td>Finger painting in directive art therapy</td>
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<tr>
<td>Complex</td>
<td>Unstructured</td>
<td>Resistive</td>
<td>Wood carving in studio based art therapy</td>
</tr>
<tr>
<td>Simple</td>
<td>Unstructured</td>
<td>Resistive</td>
<td>Coloured pencils in studio based art therapy</td>
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<tr>
<td>Complex</td>
<td>Structured</td>
<td>Resistive</td>
<td>Clay in directive based art therapy</td>
</tr>
<tr>
<td>Simple</td>
<td>Structured</td>
<td>Resistive</td>
<td>Crayons in directive based art therapy</td>
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</table>

Table 1. The combination and examples based on the Media Dimension Variables

Art materials could be a double-edged sword. It might bring disasters when the clients are not prepared with an open mind for tasks. However, art therapy provides the vehicle to restore the clients' relationship with themselves and others. Through a meaningful creative process, an individual is able to overcome inner trauma and then create a positive ripple effect on people in his life. Art therapists have a responsibility to be aware of the effects of art materials can bring about.
2.2 Expressive Movement: Messages, Metaphor and Remedy

2.2.1 Overview of Movement: Movement and Messages

In the field of art therapy, art therapists and clients are expected to generate quality conversation through visual images. Based on the visual representation, an art therapist collects indicators of a client’s emotional and physiological state. Similarly, dance movement therapists use movement to communicate with clients and discover the symbolic meaning and expressive content conveyed by a client’s movements. Thus, it is important for the researcher to investigate how movement works as a nonverbal communication vehicle, and what role movement plays in the creative process. The author is to find out whether to define movement as an action or a unit of a gesture and further review the theory and practice of dance movement therapy (DMT).

According to the Oxford dictionary, movement is defined an act of changing physical location or position or of having this changed (OED). Nevertheless, the meaning of movement is much more than the action of changing physical position over time. Kristina Stanton-Jones looked into a simple wave gesture relating to speech to illustrate various perspectives of movement. With wave this simple act, she described the complexity of movement and how movement can carry a multiplicity of meanings. This example is about a man who said, “Well, I guess its goodbye.” and then turned and waved. Stanton-Jones questioned the quality of the wave action that was performed by the man. Was the quality of the wave movement silly? sombre? Alternatively, quiet? Based on this man’s cultural background and circumstances under which he made the gesture, can we tell if the wave is a friendly wave or is it a formal ceremonial one? And further we might speculate whether the man waved in synchrony with his friend, who was waving, so that his waving signalled the end of their interaction (Stanton-Jones, 1992, p. 59).

From the previous example of waving, we can interpret movement culturally, communicatively, interactively, and symbolically. In fact, an artist is not only imparting thoughts or feeling through a visual image but also through the movement producing the image. Drawing itself is a movement. This should be the first feature shared by drawing...
and movement. Perhaps by looking into the significant American action painter Jason Pollock, we can further identify movement and its meaning. Henri Matisse’s remarks also echo the meaning of movement in drawing, "Drawing is like making an expressive gesture with the advantage of permanence."

In early 1950s, photographer Rudy Burckhardt visited Pollock at the Eastern end of Long Island. Later he recalls, “He (Pollock) told me he couldn’t paint in front of a camera,” “But he was willing to pretend, so I took pictures of him making the gestures he would make when he actually painted.” In this case, Pollock was going to pretend to be painting because of the uneasy feeling of being in front of a camera. Nevertheless, Pollock’s body movement honestly responded to his unconscious mind as if he were involved in the painting process. Carter Ratcliff, a poet, art critic, and Contributing Editor of Art in America, pointed out “Burckhardt could record no gleam of pigment slithering from Pollock’s brush, yet its absence is not obvious. The artist’s postures signal no falsity; though he’s not painting, he is not acting. He is behaving and appears to be at one with his behaviour, like someone running not for form but to get somewhere quickly.” (Ratcliff, 1998, p. 7,8).

Thus through Burckhard’s lens, we can read Pollock’s personality, emotions and perhaps speculate about his motivation from his recorded body movements. After all, the meaning of movement cannot be separated from "how movement happens”. As the nonverbal communication researcher Ray Birdwhistell argued, the meaning of movement cannot be separated from who does it, where, when, and in which interaction sequence (Birdwhistell, 1970). Another characteristic of movement is that human movement works as a mirror continually reflecting a person’s internal and external state. Psychologist Martha Davis has come out with a theoretical framework to illustrate this trait. She claims, “At any one moment, movement is simultaneously reflecting intrapsychic, interpersonal and culture patterns” (Stanton-Jones, 1992, p. 61). These states might include the processing of emotion (anxiety, defence mechanisms and unconscious symbolic communication) and interpersonal processes, which are processes of dominance, cohesiveness or relatedness. Furthermore, movement also reflects the individual’s cultural difference conventions, such as the degree of personal space and different ways of greeting from various nationalities.
Humans’ body movement, gesture or posture changes depending on the intrapsychic and interpersonal communication. However, personal movement style and cultural traits are influences that continue over time. The third characteristic of movement is that movement patterns are not only carrying meaning for words or visuals; they are the messages themselves. Instead of viewing movement as a mere parallel to verbal or visual experience. Davis argued that “Movement patterns are not simply signs of individual differences and interpersonal process; they are of them” (Stanton-Jones, 1992, p. 61).

The reason we believe that we can read reliable messages from nonverbal components more than from words is that verbal messages are delivered only by words. When the words are pronounced, the meanings are confined by words. However, consciously or unconsciously, nonverbal communication employs a myriad of ways such as facial expressions, gestures and posture to deliver messages. These ways, though influenced by our cultural background, personality and circumstances, could serve as an even more powerful vehicle in communication than words as they are all visible. As Freud says, “No mortal can keep a secret. If his lips are silent, he chatters with his fingertips; betrayal oozes out of him at every pore” (Ekman & Friesen, 1969, p. 89). The quotation illustrates inner thoughts often leak out through body movement and our body often acts more honestly than our speech.

The range of physical movement consists of gestures, facial expressions, eye contact and body movement. This body language communicates attitude, personality and emotion. In addition, even when people stop moving, their posture continues to send signals to others. For example, when a wife turns her back to her husband in the bed, her fixed body posture continues to deliver the message that could be “I don’t want to talk to you” or “Not tonight, baby”. As a result, we might assume they had an argument previously.

Ekman (Ekman & Friesen, 1969) has classified types of human movement according their sending capacity, internal and external feedback. He suggests, “The sending capacity of a part of the body can be measured by the average transmission time, the number of discernable stimulus patterns which can be emitted and visibility” (Ekman & Friesen, 1969). Among various body parts, the face is the best
sender and receiver because it has fast transmission time and its ability to present a
great number of discernable patterns. In general, people will pay more attention to the
best sender: the face. Based on evidence of distinctive movement of the facial muscles,
Ekman discovered seven universal emotions, i.e. anger, disgust, contempt, fear, joy,
sadness, and surprise. To a certain degree Ekman’s studies supported Darwin’s
idea,"...the young and the old of widely different races, both with men and animals,
express the same state of mind by the same movements.”(Darwin, 1886, p. 352). Thus it
can be seen that the face has the ability to display affection universally. However,
Ekman and Friesen (1969) also noted that the face is the major site for lies of
commission because facial expressions are usually well practiced and realized. In
contrast, the worst sender, feet/legs are an ideal source to observe for deception clues.

Additionally, eye movement and contact take an important place in social
interaction. For instance, direct eye contact is essential to demonstrate a self-assured,
honest personality in the Western society. The frequency and period of eye movement
can reflect various social interactions. For instance, when we look into each other’s face
too long, it could suggests intimacy or a power struggle. When we look into each other’s
face too little, it suggests dishonesty or disinterest. Other than facial expressions and
eye movement, humans use gestures and posture to convey messages from one to
another (Stanton-Jones, 1992, p. 75). Kristina Stanton-Jones, a dance movement
therapist, defined gesture as a unit of movement generally involving the hands, arms or
legs, which often has an expressive quality. She also defined posture as a unit of
movement involving initiation through the trunk or spine, such as a weight shifting (when
standing) or altering one’s position in a chair (when sitting). Gesture is usually used to
express ideas and emotion in conversation or works as a punctuation mark to sentences
or to illustrate images or emphasise meanings.

On the other hand, shifting posture usually implies changing topics. Thus posture
shifts usually work as a full stop to end a conversation and start a new topic. People tend
to shift from a sitting position to a standing one to show such intention.

With various types of body language, there are two fundamental concepts,
interactional synchrony and signals of relatedness in group behaviour and movement
interaction. They are frequently applied in Dance Movement Therapy. Interactional
synchrony usually occurs in the interaction between an infant and a mother. Incapable of speech, an infant can still express a degree of engagement with the mother by smiling or avoiding eye contact. Interacting with a mother’s gestures and facial expressions, an infant is learning to adjust to external stimulation and to control emotions. Its importance should not be taken lightly; we know that when a mother fails to show any facial expressions in response to an infant’s smile, it could cause anxiety in the infant and slow down its development.

As Kendon notes, “To move with another is to show that one is ‘with’ him in one’s attention and experiences. Coordination of movement in interaction may thus be of great importance since it provides one of the ways in which two people signal that they are ‘open’ to one another, and not to others”(Stanton-Jones, 1992, p. 74). When an infant and mother share rhythmic movement together in an interaction, the interactive synchrony shows there grows an intimate bond and a secure relationship.

Stanton-Jones (1992) postulated that the theory of interactional synchrony is underpinned by Marian Chace’s mirroring technique. It is important to be aware that the nature of interactional synchrony is more than merely copying another’s physical movements and behaviour. Instead of passively trying to understand clients, Dance Movement therapist actively enter into a nonverbal dialogue and interact with them through movement. DMT research shows that clients perceive more sympathy when the therapist retains their movement style in synchrony process. Further, Fraenkel (1983) investigated the relationship between synchrony, echoing and empathy in dyadic session. She pointed out that when synchrony works as delayed or echoed, it encourages clients to perceive more empathy from the therapist’s movement compared to simultaneously mirroring (Fraenkel, 1983).

The other crucial concept is signals of relatedness in group behaviour, which was noted by nonverbal communication pioneer, Albert Scheflen. His research (1968) illustrates how people signal relatedness in groups or pairs. He examined the two aspects of posture: body orientation and postural congruency. Body orientation includes face to face or side by side. When face to face orientation occurs in a situation, people usually exchange information or feelings. Face to face orientation can be seen in the teacher/student or therapist/client relationships. When face to face occurs between two
individuals, the body orientation can be very intimate. As a result, most of the time therapists prefer to orient side by side, or they sit in front of a client in a therapy session. When communicating or doing tasks together side by side, people can engender intimate relationship through body orientation. Nevertheless, it is not as intensive as face to face. Postural congruency takes place when two people’s body positions are identical. The idea of postural congruency can also be used as indicator of association. In contrast, postural incongruence indicates dissociation (Scheflen, 1964). These two aspects of posture show how our body signal in a nonverbal way.

In summary, physical movement imparts messages through the quality of movement. Thus, the meaning of movement cannot be separated from who does it, where and when. It also reflects the mover’s personality and culture background. In addition, the intrinsic nature of movement not only works as an illustrator but also is part of the interaction process. As nonverbal communication relies on facial expressions, eye contact gesture and posture to engage people, the dialog is created through message senders and receivers on a constant reciprocal basis.

2.2.2 Movement as a Metaphor

While learning how to read and express information through body movement, we learn to use movement as a metaphor that provides us with the vehicle to dive into the imagination and connect to inner feelings and memories. While originally metaphor is a term applied in the literature or verbal communication as a figure of speech to compare two dissimilar things that actually have something in common, it is equally valid for non-verbal communication as it helps us to understand the target domain and the source domain. We see a comparison between two domains, and we can understand an intangible subject easily in context of the tangible. In non-verbal communication, for example, as we listen to a piece of music, our emotional life experiences can be recalled. While we are looking at a painting, we might project our self image into the picture and respond with an emotional experience. Therefore non-verbal metaphors not only can bridge the gap between two non-linguistic realms but can also be essential to our experiencing various creative expressions such as art, music and dance.

The core of movement metaphor is that the body and mind are one. This is also the fundamental theory of somatic. Daria Halprin, an American psychologist, dancer and
actress, described the inseparability of body, mind and life experience as “Our bodies contain our life stories just as they contain bones, muscle, organs, nerves and blood.” In order to illustrate the relationship of movement metaphor with others, she noted, “Just as the physical body gives us a literal and concrete structure that expresses who we are, so every part and function of the body can also be understood as metaphors for the expression of our being. We feel and observe our life experiences through our bodies. Focusing on the body and its language of expressive movement, we are able to draw our awareness to sensation, posture, gesture, emotion, and thought in concrete ways.” (Halprin, 2008b, p. 17). Daria’s theory bridges the fields of somatic psychology, movement/dance therapy, and expressive arts therapy. In the therapy practice, she attempted to engage clients to express a theme with various creative forms such as drawing, dancing and poetic writing. Through body movement integrate a person’s physical level, emotion level and cognition level.

Since the primary language of the body is movement, we are able to access our inner state through body movement. We can express our inner reality and interact with the external world. In order to gain knowledge of how movement reflects our physical state, emotional state and mental state. Halprin (2008) suggested the following principles to learn this practice.

- Our bodies are our vehicles of awareness.
- There is a relationship and interplay between the physical body, emotion, and thinking.
- Body sensations, postures, and gesture reflect our history and our current ways of being.
- When we engage in expressive movement/dance, the ongoing themes and patterns from our lives are revealed.
- When we bring sound into our movement, we are giving voice to our feeling and stories.
- When we work on our art (whether a dance, drawing, poem, or performance), we are also working on something in our lives.
(Halprin, 2008b, p. 20)

In order to investigate the ways to facilitate the revelation process of our inner state and discover how art can cure our disturbing experience, Halprin (2002) suggested we re-examine how we work with body and movement at the three levels of awareness and response. Based on her notion that body can reflects one’s physical, emotional mental and spiritual being (Halprin, 2008, p.104), Halprin has classified the awareness and responsiveness of body into three levels.

These three levels consist of the physical level, emotional level and mental level. Each level can be observed respectively, while at the same time, they are all connected together. The ground level of awareness and response is the physical level including sensation, body posture, body parts, gestures, and movement. The position of the physical level is in the centre of the body. This level focuses on what is happening in the physical body. The second level is the emotional level located near the heart. The emotional level involves feelings, such as anxiety, joy, calm, excitement, anger, and sorrow. The third level, awareness and response, is the mental level relating to images, memories, associations, involves the abilities of planning, analysing, remembering, imagining and fantasizing.

The key principles of Halprin’s theory are that emotional responses and mental impression are rooted in physical expression. However, interpersonal and intrapsychic conflicts can be caused by isolating any level or putting levels in conflict. In contrast, when each level is aligned with the others, a higher degree of expression, creativity, and awareness is possible. Furthermore, we can integrate our mind, emotions and body when there is more creativity in the interplay between these three levels. Thus creativity is the fourth level which is beyond any of the three levels. “In working with creativity, we are opening to the essential impulse toward life, to new perceptions and possibilities, and to learning how the mind can go beyond attachment to a particular circumstance.”(Halprin, 2008b, p. 105).

In order to explore the three levels of awareness and response, Halprin suggested working with several different directions which are ascending and descending, looping and interplay to reveal voices and messages from body.
To work with ascending and descending directions, we could start with the ground physical level and focus on breathing, sensations, and body movement. Then we could work upward to the emotion level by concentrating on feeling responses. Finally, we could work with images and thoughts in the mental level. Once we recall our memories, activate our imagination or think about a theme, we can explore the emotions that are connected with each theme. At the end of descending, we shift our focus back to breathing, sensations and posture.

A looping direction can start with any level then switch from one to another. For instance, we might start with thinking about a theme or an image then pay attention to the emotions related to it. Then return focus to the thinking process.

![Figure 4. Three levels of awareness and response](image)

When we work in an interplay direction, we could work on connecting and transitioning between these three levels. We could identify which level is evoked or fall away. Or we might even engage all the levels with an image or a theme at the same time. A movement-based therapist is able to be a skilful witness to guide a client and report what is happening and what can happen next to the client (Halprin, 2008). " As we work creatively on each of the three levels, we begin to identify personal strengths and weakness, as well as habitual patterns and blocks" (Halprin, 2008b, p. 109).
In the late 1960s, Anna Halprin (1995) put forward the psychokinetic visualization process method while exploring dancing and drawing. In the healing process, participants draw, move and create poetic dialogues. In order to clarify that the process is more than visualization, she changed the name to Psycokinetic Imagery Model to emphasise on expression with sensations, images and narratives. Adopting these three art forms, drawing, poetic dialogue and movement, participants are able to transform and work the entire psychic. In the creative process, participants work with visual, auditory senses and further integrate body, emotion, cognition and imagination.

![Figure 5. The psychokinetic imagery process](image)

While working on a psychokinetic imagery model, participants can work with the three forms in any order. Anna Halprin used the phrase “become image” or “break down the image” to facilitate participants making a connection between the two forms. Thus participants could bring out the meaning of pictures through body movement. When working toward poetic dialogue, she guided the participants by asking “if movement could speak what would it say? If the drawing could speak, what would it say?” (Halprin, 2008b, p. 134). In this way, the three art forms could easily be transformed from one into the other. For instance, movement can be seen as a painting that leaves no traces. Drawing can be seen as visual record of dance or body movement. Moreover, if participants are working in a group, they can exchange their drawings for feedback and possibilities for change. In the psychokinetic imagery mode, participants reveal their inner state unconsciously through working back and forth between art forms. It is important to beware that the process is more important than the final product. Instead of
focusing on technical skills, participants should focus on listening to their inner voice, expressing feelings and accepting whatever images emerge without judging (Halprin, 2008b, p. 134).

Through metaphors, we can fill the gap between internal and external movement, and further understand how movement and body relate to our life experiences. As Halprin used to remarked, “As our body posture changes our life change as well.” The notion of three levels of awareness and responses and psychokinetic imagery model provide us with a framework as to how to access the inner word and open new possibilities through art, dance and poetic dialogue creativity. “When we are working on a drawing, we are also working on something in our lives. When we are moving, we are moving something in our life.”(Halprin, 2008b, p. 136)

2.2.3 Healing through Movement

In order to catch a glimpse of how movement is employed in therapy, the following section will review certain features of dance movement therapy. Dance movement therapy is one type of expressive art therapy. According to the American Dance Therapy Association, the definition of dance movement therapy is “the psychotherapeutic use of movement to further the emotional, cognitive, physical and social integration of the individual” (“ADTA - About Dance/Movement Therapy (DMT),” 2011). DMT expresses inexpressible feelings and integrate self-image through body movement individually or interpersonally. Stanton-Jones described DMT as “Movement is used to facilitate change within individuals (intrapsychically) and in their ability to relate to others (interpersonally). The patient becomes aware of how emotional and bodily experience is connected, and, by freely associating with words, how movement can yield images, which are then analysed as a means to psychological understanding”(Stanton-Jones, 1992, p. 1). The realm of DMT is related to body knowledge, psychology, nonverbal communication, mental body movement and analysis of the quality of movement. The scope of the DMT applications can be illustrated as below.

- **Effective for** people with developmental, medical, social, physical and psychological impairments.
• Practiced in mental health, rehabilitation, medical, educational, and forensic settings, and in nursing homes, day care centres, disease prevention, health promotion programs and in private practice.

• Focuses on movement behaviour as it emerges in the therapeutic relationship. Expressive, communicative, and adaptive behaviours are used for group and individual treatment.

• Used with people of all ages, races and ethnic backgrounds in individual, couples, family and group therapy formats ("ADTA - About Dance/Movement Therapy (DMT)," 2011).

Although dancing is a common form of entertainment in various cultural traditions, dance and movement has been categorized formally into a theory for therapeutic use since the 1940s. Marian Chace is considered the principal founder of DMT in United States. She recognised the therapeutic effect of dance and movement while practicing dance with her students. Today DMT is applied extensively to health rehabilitation centres, day cares and medical centres. In the creative movement session, a client is able to release frustration and anger in a safe setting. In general, DMT can be applied to people with autism, mental illness, learning disabilities, eating disorders, etc.

The aim of DMT is to “Use movement experimentation to explore new ways of being and feeling and to gain access to the feelings that can’t be verbalized” (Stanton-Jones, 1992, p. 3). It is important to be aware that DMT is different from verbal therapy and body therapy such as T’ai chi and yoga. In DMT, movement is not merely about moving accurately or freely; movement also works as a medium to help people draw forth the internal voice and find personal meaning while exploring body movement unconsciously.

In summarizing Stanton-Jones’s explanation of DMT therapists (Stanton-Jones, 1992), a dance movement therapist is trained to elicit movement interaction with therapeutic benefit from the patient and give appropriate instructions to allow improvisation to take place in groups. Just like art therapists understanding colour, shape and knowing how to draw symbolic meaning from visual images, the DMT understands movement and the way it conveys meaning through its quality in space, weight, time and flow, as well as rhythm (Stanton-Jones, 1992, p. 3).
The process of DMT is to work from kinaesthetics toward emotion, cognition and creativity. “The DMT group process is essentially one that progresses from movement to image to interpretation. “ (Stanton-Jones, 1992, p. 3). This process of DMT is categorized by Meekums into four stages: preparation, incubation, illumination and evaluation. Each of them has its own set of goals and its influences on the others in a cycle. The preparation stage is aimed at warming up and building trust in a therapy setting. The second stage, incubation, works toward encouraging the inner voice to surface by relaxing and letting go of the consciousness. For example, the patient might be asked to incorporate an image into a movement. The third stage, illumination, is seeking meaning from the symbolic movement experience. The last stage is discussing the progress, describing the quality of the movement and preparing to end the session. This cycle can be revisited several times in a therapy session (Meekums, 2002). The outcomes of unconscious processes are expressing movement, releasing feelings, interpreting symbolic meaning, gaining self-awareness and transforming self-image.

![Figure 6. Process of DMT](image)

The practice of DMT is underpinned on five theoretical principles. By understanding these principles one can understand better the role of movement plays with regards to body, mind, therapist, client and creativity. These essential assumptions are as follows:
1. Mind and body are in constant complex reciprocal interaction. While movements change significantly, movement can affect the entire body at a physical level, emotional level and cognitional level.

2. Movement reflects aspects of the personality, including psychological developmental processes, psychopathology, and expressions of subjectivity and interpersonal patterns of relating.

3. A key principle is that the therapeutic relationship established between the patient and the dance movement therapist is central to the effectiveness of DMT.

4. Movement evidences unconscious processes, in a manner similar to dreams and other psychological phenomena.

5. The creative process embodied in the use of free association in movement is inherently therapeutic (Stanton-Jones, 1992).

This section reviews the meaning of DMT, by illustrating the aim, process and principles of DMT in the hope of gain knowledge of how movement can aid the restoration of mental balance and further establish better interpersonal relationships between the clients and others. In the next section, the researcher will further explore how quality of movement can affect psychology by investigating the choreographic movement analysis system Laban (1969) and Bartenieff’s (1980) effort-shape correlates.

2.2.4 Movement and Psychology

The human body carries messages through movements of various qualities. In psychology the characteristics of abnormal movement can be used to categorize mental illness, such as different types of schizophrenia. The movement of breathing, facial expression and the sleeping posture all give away our personality and other information.

This session is to discuss how quality of movement is associated with the human mind and attitude through the angle of movement psychology.

Movement psychology has integrated Laban and Bartenieffs’ theories. Rudolf Laban’s (Laban and Lawrence, 1969) choreographic movement analysis systems aid both researchers and therapists to analyse movement and understand combinations of
movements as a language. Based on Laban’s system, Bartenieffs’ (Bartenieff & Lewis, 1980) effort-shape correlates theory facilitates therapists in mapping movement to mental state. By applying both of these theories, a therapist is able to read meaning from the movement emotionally and kinaesthetically.

Rudolf Laban is considered to be a significant pioneer in contemporary dance history. His theory is not only applied to contemporary dance but also to culture and nonverbal communication studies. This cross-disciplinary use of his study relates to his wide background of interests. He has worked as an architect and a painter before he became a choreographer. In the 1920’s, he also founded several dance schools in Germany and became an important figure at international conferences.

In order to let dancers express emotions with precise movement, Laban’s developed a choreographic movement analysis system which includes Labanotation and effort analysis (1969). The purpose of Labanotation is to help a dancer visualize movement and shape symbolically in choreographic practice. The term ‘effort’ in German means literally ‘drive through’, denoting a fundamental movement quality. ‘Effort’ describes the qualitative nuances of movement.”(Stanton-Jones, 1992, p. 69). The effort consists of four motion factors: time (sudden/sustained), weight (strong/light), space (direct/indirect), and flow (bound/free). Each factor contains two opposite polarities. Significant everyday actions occur in combination. In this system every movement can be categorized by time, weight, flow and space. According to Laban’s theory, there are eight major working actions which are described as Float, Punch, Glide, Slash, Dab, Wring, Flick, and Press. For instance, the punch action can be seen as direct, strong and sudden. Float can be based on a combination of lightness, indirectness and sustainability

Time and space are essential elements of all physical motions. Time especially is the foundation of other compound motion factors. The characteristics of time involve past/future, presence/absence and rhythm. The variation of time can make a subtle difference within expression. For example, when we shake hands with someone quickly or sustain shaking that may create a different impression. The definition of weight is “the degree of energy spent in overcoming one’s own body weight, or that of an object, which expresses itself in the effort attitude toward the weight factor”(Laban & Lawrence, 1969,
In addition, weight factor is influenced by degree of tightening fundamental body muscles. Space factor involves how body movement reacts to and navigates in space. When navigating through space one’s movement can be direct or indirect. For instance, sappers’ searching for landmines under a battlefield with multi-focus can be categorized as indirect movement. In contrast, a suicide bomber’s jumping himself toward a specific target is the direct use of space effort.

The factor of flow refers to continuity and fluency of movement. It is the development of movement with the weight and space factors in time. The degree of flow can depend on the velocity, space expansion or force the movement might produce. In general, people often find pleasure in expressing themselves freely in space; better still if the free flow cannot be easily stopped or interrupted. In the “bound” factor, movement usually relate to restricted use of force. Each motion factor may either struggle against or indulge one another. By observing these four types of motion factors we gain concepts and impressions of movement (Laban & Lawrence, 1969).

In Irmgard Bartenieff’s study, “Body Movement: Coping with the Environment”, she connects the four motion factors with mental states. Flow – emotion; space - attention; weight -intention; time-decision. In her framework of effort-shape notation, each of the motion factors can be understood by answering a particular question.

Weight (strong/light) is correlated with the quality of intention. The question that needs to be answered with weight motion factor is “What’s my impact, or intention?” The effort of lightness usually presents sensitivity in the form of an activity conducted by someone. For example, lightness of motion could happen when a daughter sneaks back home quietly in the midnight. The strong quality of weight can occur when a furious housewife slammed the door without turning her head back. Second motion factor, space (direct/indirect) reflects the quality of thinking. The implied question,”Where?” is revealed while people are navigating through space. The central question related to space factor is “In what manner do I approach the space?” Instead of arranging and focusing the position of the body and limbs in space, “the term space refers to the quality of body movement in space”(Stanton-Jones, 1992, p. 71). The third motion factor, time, is correlated to quality of decision. Based on urgency or none-urgency, rushing or delaying, the state of mind causes the sudden and sustained motion quality. The
question related to time effort is “When do I need to complete the action? For instance, a student jumps into train just before the door is about to close. With the time pressure the student makes a quick decision and finishes the action before the door closes. On the other hand, we solve easy tasks without urgency such as standing in front the refrigerator for a long time to choosing a flavour of ice cream. The last motion factor, flow, is related to the quality of emotion and feeling. The question correlated to the flow is “How do I keep going?” The quality of flow can be influenced by a level of control. When a kid is doodling with loose simple shapes freely, free flow is easy and helps him express emotion through spontaneous movement. In contrast, when an art student is depicting a life model’s figure with one continual line, the bond flow represses emotion inwardly because of the restrained movement.

According to Bartenieff’s interpretation of movement in a clinical setting, the quality of movement can indicate mental illness. Stanton-Jones (1992) illustrates two mental case studies, emotionally constrained and diminished sense of self. The first case is about a person who is intellectually superior but is emotionally tense. In reality, she had been accepted by a prestigious university. However, her emotional quotient is not level with her intellectual quotient. Her emotional state is described by her therapist as “falling apart”. In the second case, a woman is unable to lose weight. She reported to her psychiatric nurse-therapist of feeling “like nothing and nobody.” It is clear to see that this woman lacks a sense of self emotionally, which is affecting her physical body.

In this chapter, the researcher started by describing the meaning of movement and further illustrated how human movement carries messages. In order to find out how movement can facilitate creativity and integrate self-image, the researcher explores the possibility of reading movement as metaphor. In addition, Dance Movement Therapy and movement psychology were investigated as to how movement can be employed for healing purposes. It’s important to remember that movement is primary vehicle of communication. As movement interaction designers believe, the world is inherently meaningful. People actually perceive the world in terms of what they can do with it. As long as human beings exist, they access the meaning of the world and express the meaning through their physical interaction with others. (Hummels, Overbeeke, & Klooster, 2006, p. 1)
The purpose of introducing Laban’s Effort analysis is to aid readers to build up a range of movement vocabulary. With this systematic way, we can understand the characteristics of movement, review the psychological perspective of motion factors and further explore how external action and internal mind are connected, all of which are seminal to the effect of movement on people’s mental and emotional health.

2.3 Tools for Contemporary Art Therapist

In order to design an appropriate computational drawing tool for contemporary art therapist, the researcher reviewed current usage of computational art tools in art therapy, further investigated difficulties and issues in current art therapy practice. The goal is to apply technology, namely motion-tracking technology, to facilitate patients’ expression and therapists’ observation in the process of art therapy. In next section, the researcher will discuss relevant computational motion-sensing drawing tools for art therapy usage.

2.3.1 Usage of Computational Art Tools in Art Therapy

The development of computational art tools can be traced back to the 80s. With the emergence of affordable personal computers, some pioneers such as Weinberg (1985) and Canter (1989) started to experiment with the possibilities of using computers as a tool in therapy sessions. Weinberg devoted himself to applying computer art to treating people with disabilities, brain trauma and cerebral vascular accidents. In 1989, in art therapist Deborah Samet Canter’s article, “Art Therapy and Computers”, she made a convincing argument as to why computers would be a medium of choice in working with children and adolescents, in particular those who have learning disabilities and concurrently behavioural and emotional problems. She compared the computer to “a teacher who does not get mad about mistakes, but gives individual attention, and lets clients work at their own pace” (Wadeson, Durkin, & Perach, 1989, p. 302).

The 1997 Hartwich and Brandecker’s study indicated that computer painting programs, rather than traditional painting materials, can provide a more psychologically safe treatment to the people with serious mental illnesses. Furthermore, Mcleod’s (1999) article pointed out that computer art making is no longer inaccessible to clients, especially for children and adolescents, who are used to playing computer games. He
pointed out that they could easily make transition between sensory and non-sensory and navigate in virtual space.

In the 21st century, digital media and applications are easy to access and ubiquitous. Common computational art tools in contemporary art therapy include mouse, graphic tablet and touch devices. The software includes photo editing programs, drawing programs and 3D sculpture programs. The design of graphic user interfaces and tangible user interfaces are getting more and more intuition and user friendly. Thus, these innovative technologies provide contemporary art therapists with other alternatives in a clinical setting. Below are some examples that have been implemented in contemporary art therapy clinical settings.

The first example involves a project on treating autism spectrum disorders. The people on the spectrum have difficulty in verbal or non-verbal communication, social interaction or even play. A group of teenagers were given a free 3D modelling software program, Google SketchUp, to express and communicate ideas visually. With this easy-to-use tool, these autistic teenagers were able to create their dream room, a playground and a Hogwarts Model. Through designing virtual space, they started communicating and interacting with others (Kintsch, 2011).

In addition to building 3D environments, Thong presents various case studies in a clinical setting, which shows the benefits of using computer-generated artwork to provide therapeutic modality and foster the relationship between therapists and clients (Thong, 2007). These case studies involve using traditional art making methods (drawing, painting, photography, and sculpture) with digital art applications. The applications include Adobe Photoshop, Flying Colors, and People Putty.

In one of the case studies, Frank (pseudonym) is an adolescent who likes to draw anime. Because of a knee surgery, he had to stay in the hospital for two months. When an art therapist introduced computer art making with a mouse and Photoshop, he began to explore the tools and functions in Photoshop, such as layers, colour tool and undo. His artwork, entitled “Frankie Had a Bad Day”, was a digital sketch in pencil and colour. His artwork shows an angry character with a leg wrapped in gauze. Afterwards, his artwork was displayed in his hospital room. The visual actually served to voice his
emotions. With this visual representation, he was able to communicate and share his distress with the doctors and other patients in the hospital.

Another case is a nine-year-old boy, Julian, injured when playing basketball. Watching him playing and experimenting with a computer, his therapist noticed his interest in superheroes. Then he suggested that Julian create a collaged image and make a story out of it. To accomplish this, the therapist took pictures of Julian and imported them into the Flying Colour, a digital stamp allowing a user to rotate, distort and scale images. In the computer art making process, Julian chose a skyscraper from a library as the background. Then he placed his own picture on the ground and in the sky. In the picture, he is flying with spreading arms across the scene. He created a story of “Super Julian” who flew “like Superman”. His work reflects his energy and courage.

The last case study is about a boy called Jun. He was reported as both compliant and aggressive at school. However, he is always calm in his art therapy sessions. It seems he only becomes sensitive in the creative art making process. Thus, he was introduced to a 3D character programme called People Putty. He transformed a default human character into a dragon-like character. He added vampire teeth, dissimilar eyes and corpse-like green skin. In order to express his dragon character’s temperament, he reset the character’s facial expression to a combination of anger, sadness and happiness. Jun’s artwork clearly revisited the duality of his temperament as described by his teacher. Through the virtual space, Jun was able to reveal and explore his anger issues safely. The aforementioned cases echoed Tong’s remark, “computer art making has become an integral part of the process of making art and is a valid medium for individual self-expression and art therapy” (Thong, 2007, p. 1).

In contrast to burgeoning computational art making tools and software, there have been few prototypes created by contemporary interaction designers for therapeutic purpose. In 2009 Park, Kim, Choo, Lee and Kang attempted to create an online animation therapy program and an offline Kino-Ani drama therapy program to reduce anxiety and violence in children and adolescents caused by excessive use of video games and media (Park, Kim, Choo, Lee, & Kang, 2009). Their study explores the concept of using animation to integrate various genres of therapy. It further combined virtual reality and augmented reality in web form to help users release stress.
In addition, Hoey, Zutis, Leuty, Mihailidis and Leuty created a touch screen device for assisting art therapists in treating seniors with cognitive disabilities (Blunsden et al., 2009). The touch screen interface and artificial intelligence software were integrated to monitor and interact with a user. Another touch table device for art therapy is a virtual sand tray. Mark Hancock hoped through interaction with 3D objects and a virtual painting system, therapists can understand a client's psyche (Hancock, ten Cate, Carpendale, & Isenberg, 2010).

These innovative computational art tools and case studies reveal the significant potential to apply computer art making to art therapy practice. However, as yet, digital media are still considered to be a peripheral solution for artistic expression in a clinical setting. According to Kuleba’s 2008 survey, which involved 208 participants in the United States, 84% of art therapists considered the computer is important to art therapy practice, yet they were not using computer art making with their clients. Only 14% of the respondents to the survey acknowledged that they were using computers to create artwork with clients.

To this prevalent resistance to using computers in clinical setting, Cathy Malchiodi remarked, “Art therapy as a field is a slow adopter of new ideas” (Malchiodi, 2009). She further addressed this issue by noting a few phenomena, such as the fact that contemporary art therapy journals do not cover much digital and social media involvement such as the well-known project sketch-up. Art therapists have even been hesitant to use photography as an intervention in a clinical setting. She also described that “art therapists tend to remain loyal to traditions, even when those traditions are not proven to be best practices,” (Malchiodi, 2009) which concurred with Waller’s point of view. In 1993 Waller felt the need to investigate new media and art forms in art therapy practice. He noted that “Sometimes I feel that as art therapists we can get stuck with paint and paper not only because we are usually short of space but because we may be a little trapped in the conventions of the traditional ‘studio’: and the convention of ‘art expression’, when it refers to art therapy” (Moon, 2010, p. 5). Unfortunately, the traditional art forms and art materials sometimes can become stumbling blocks to stop art therapists from stepping out of their comfort zone.
In Kuleba’s survey 27% of art therapists are currently using computers to create artwork. She concluded that that “art therapist are not using computers in art therapy due to their lack of experience and training, and also possibly due to the lack of research relating to the implications of their use” (Kuleba, 2008, p. ix). She further recommends research into what determines the benefits and effectiveness of using computer art making in art therapy practice. The reason why technology is slowly adapted to the field of art therapy could be that traditional art materials meet most needs in art therapy practice. Therefore, there is no pressing need for art therapists to explore new media. However, people with autism or other disorders “beg the field to reconsider its best practices with this population.” (Malchiodi, 2009). For some client groups, the need to integrate technology into therapy is urgent.

The advantage of using a computational art tool as an adjunct in art therapy is that digital media have changed the linear creative process. With the ability to undo and separate layers, there is no need for clients to worry about making mistakes in the creative process. In addition, without physical touch the art materials might give a client the feeling of a safe physiological environment. Furthermore, younger generation is growing up in a computing environment. Even young children spend much time operating digital devices, such as smart phones and touch screen devices, to conduct their daily activities. Children and adolescents might even feel more familiar with a computer than a pen and paper. Thus it is easier for them adapt to new technology and interacting with a computer could even inject a fun element into the art-making process. Thong states, “Regardless of the population, my thorough knowledge of computer tools furthered my function as a therapist and extension of the ego by becoming the child’s ally through his or her creative journey” (Thong, 2007, p. 1).

Beyond the visual artwork itself, due to the physical limitations of traditional art materials, art therapists have also found that it is difficult to record the creative steps or to observe a client’s body language without interrupting clients (D. Eleniak, art therapist interviewee, Appendix E, personal communication, October 29, 2010). Whereas with traditional art making, a therapist cannot review previous images hidden under layers of a finished painting, digital art allows reviewing by undoing each step.
Moreover, when using traditional art materials, clients might feel under pressure to make a quality artwork. For instance, Hartwich and Brandecker (1997) found that “many people feel inhibited when they are asked to paint in a traditional way. They do not feel able to transfer their feelings and experiences onto paper. They argue that they are not artists” (Hartwich, 1997, p. 371). Computer-generated art makes it easy to polish an artwork.

This is not to say computer-based art making is without drawbacks in art therapy sessions. In the past, the researcher worked as an illustrator in a corporation. While using a tablet and painting software, the researcher missed the smell of pigment and the sense of touch. For some clients, this might be important, as the natural qualities of materials may be essential for the art therapist to trigger a client's memories via such senses as touch, temperature and smell. In addition, the size of a tablet only allows a user’s movement from fingertips to the shoulder in a sitting position. Finally, there is no customized computational art tool for art therapists and clients and mastering computer-generated art can sometimes be quite daunting for both of art therapists and clients. This is especially true for people who are not familiar with using a computer and professional art-making software.

In conclusion, traditional art materials and computer-based art media have their respective strengths and drawbacks. Neither is absolutely better than the other. In fact, they are complementary. When implementing digital technology in a clinical setting, Thong noted, “This is not to say that all the children preferred making digital art over using traditional methods. However, many were able to find a comfortable way of working with both” (Thong, 2007, p. 1). Some people might be concerned that excessive use of a computer might lure clients into a virtual world (Gerity, Henley, Howie, & Kramer, 1996). As Parker stated, “While there is legitimate concern about possible misuse and addiction to computer games or the Internet, it is unfair to assign only a negative value to computer use. Characterization of computers as evil destroyers of the creative process discourages a more proactive use of computer media and limits opportunities for innovation within the field of art therapy” (Parker-Bell, 1999, p. 2). For a contemporary art therapist, it is important to be familiar with the various properties of art materials and media and choose the right material/media for the clients with an open mind.
2.3.2 Computational Drawing Interaction

In this section, the researcher intends to illustrate examples of drawing in the realm of human-computer interaction to discuss use of interactive digital tools in art therapy.

In general, tool use is a goal-directed activity. Through artifact tools, users are able to amplify functionality of the tools and transfer problems to a manageable form. Invented by pioneer, Ivan Southland in 1963, the first digital drawing interface, Sketch Pad, consists of a tangible light pen and a graphic user interface. Since then innovative technology and new media have continued to challenge the traditional drawing methods. Drawing is no longer leaving trace on a piece of paper. Drawings can be projected on the buildings or in an immersive environment. Moreover, the computational drawing interface is no longer designed to mimic traditional art materials. With novel sensing devices, interactive designers are engaging users to explore modality and experience new perceptions in the drawing process.

The first interactive drawing example is a tangible drawing tool called I/O Brush (Ryokai, Marti, & Ishii, 2004). I/O Brush is designed to enable young children to pick up colours, textures, and movements from the objects in the environment. This project emphasises the process of drawing by enhancing their selecting ability. Transforming physical objects into digital drawing helps children think critically and communicate with others. The concept of I/O Brush uses a traditional pen to pick up ink then transfers it to paper. Ryokai, Marti, & Ishii use a Wacom Cintiq as the digital output canvas. The brush tip is made of touch sensors, light, a camera and optical fibres. By capturing a photo, children are able to paint with the special ink just picked up. Under its movement model the I/O Brush can grad up to 30 frames of the brushed surface.

In the study, a group of children in kindergarten picked their special colours from class items, clothes, personal belongings and their bodies. Most of the children easily grasped the abstract concepts and function of the I/O Brush. One girl said, “I want the ticklish one!” (movement mode) as she wiggled her body to capture the movement of her tummy with the brush. When the children talked about their drawings, they are keen to explain the associated stories and physical objects illustrated. (e.g., “It’s a monster eating a boy. Yellow is the monster and the pink is the boy!” where “pink” was taken from the child’s own skin!”).
As art therapy emphasizes the process of drawing more than the end product, the I/O Brush is ideal in encouraging children to explore the process of drawing by connecting real world objects to digital drawings. This is especially true when children draw images with personal belongings or their body parts and might provide relevant psychological evidence for art therapists to observe. By enhancing the ability to extract meaning from real objects and communicating with others, the I/O Brush has the potential to be applied in an art therapy practice.

The second drawing interaction example explores the idea of turning invisible voice into visual forms. In 2003, a concert performance, *Messa Di Voce* (Italian for "Placing the voice"), was created by Levin and Lieberman. In the “Pitch Paint” section, two virtuosic vocalists shouted and sang in real-time on stage using interactive visualization software. When the performers made noise or spoke to each other, they generated a visual conversation on screen. The performers painted lines by modulating pitch.

The interactive system also had the ability to track the performers’ head locations and the position of their bodies. Thus, when they made noise, a virtual stroke appeared from performer’s mouth in screen. By capturing audio signals from the performer’s microphone, the computer could extract the pitch and spectral content to couple with a visual drawing. Thus, the performers were able to control the direction, thickness and speed of strokes using their voices. With a puff sound, they were able to blow a drawing away. With the sophisticated system and professional singers, pitch paint created an imaginative and poetic dialog between the audiences and performers.

In another similar exploration, in 2009, Zefrank created a simple version of a voice-drawing applet in web browser format. Through a built-in microphone, users were able to control the direction of a line, straight, clockwise, and counter-clockwise, based on the level of volume. In his experiment, he was able to illustrate various faces.

Although using voice to draw is a difficult task, cognitive psychology and art making are closely related. According to a famous finding in Wolfgang Kohler’s psychology experiment, all viewers are able to associate the sound “Maluma” with a round shape. And the sound of "Takete" with a sharp shape, so even if drawing with voice might not able to create symbolic images, observing abstract colours and lines
might still help a therapist to reveal a client’s inner state. In addition, by using this playful method, shouting and singing might enable clients to release intense emotions.

In addition to the previous projects, drawing tools such as Paul Bach-y-Rita’s BrainPort (Bach-y-Rita & W. Kercel, 2003) and Mick Ebeling’s EyeWriter are designed to compensate for sensory loss and physical disability. Paul Bach-y-Rita was an American neuroscientist, whose most notable work was in the field of neuroplasticity. He introduced sensory substitution as a tool to treat patients suffering from neurological disorders. Sensory substitution is using one sensory modality, mainly the tactile, to gain environmental information to be used by another sensory modality, mainly vision. The BrainPort vision device translates information from a digital video camera to a user’s tongue, through gentle electrical stimulation, in order to replace a user’s sight or vestibular function. In a case study Ms. Schiltz who has balance issue claimed, "I danced in the parking lot. I was completely normal. For a whole hour“ (Blakeslee, 2004). Another case is after he used the Brainport, Weihenmayer found doorways, caught balls rolling toward him and with his small daughter played a game of rock, paper and scissors for the first time in more than 20 years.

In 2010, Mick Ebeling and his group created a low-cost, portable EyeWriter glasses for some paralysed patients to express themselves in art and communication by eye movement. This innovation allows Quan, an L.A based graffiti artist diagnosed with Lou Gehrig’s disease in 2003, to draw again. After he tried out his EyeWriter, Quan said, "It feels like taking a breath after being held underwater for five minutes."(Webley, 2010)

In summary, these studies show digital technology is capable of engaging users in exploring modalities, interacting with the environment and socializing with others during the drawing process. It indicates that there should be more cooperation between various disciplines to aid art therapists in therapy sessions. The researcher hopes that integrating technology and cooperating with other experts not only can benefit people with sensory loss or disorders, but can also help the general public solve personal conflicts and increase emotional well-being.
2.3.3 Computational Motion-Sensing Drawing Tools

Human body movement and gestures are significant elements of our ability to communicate and interact. Through body movement, humans manipulate objects, express inner feeling and deliver messages. In order to enhance the extent to which art therapy clients are able to express themselves, the researcher investigated inventions that allow users to draw in the air and produce images in three dimensions by using full-body movement. It is hoped that reviewing these projects and devices would help the researcher design an appropriate tool and to facilitate interaction appropriate to art therapy. A second step would be to further analyze the strengths and drawbacks of a motion-sensing drawing tool.

The desire to draw in the air can be easily exemplified in the manner children play with sparklers – waving them about, running with them, etc. The first effort to capture in-air drawing occurred in 1914, when Frank Gilbreth, along with his wife used small lights and camera to track the motion of workers and created the first light painting. Today we know light painting as a photographic technique. People can create an image either by moving hand-held light devices or camera while an exposure is made. Man Ray is the first photographer known to use this technique. However, he considered himself a painter above anything else. In 1935, he created a series of paintings titled ‘space writing’. These painting include a series of swirls and lines in the air. By using a mirror, you can read the writing. In 1949, Spanish painter Pablo Picasso collaborated with photographer/ lighting innovator Gjon Mili, who used this technique to study a dancer, a musician and a skater’s motions. In addition, Picasso had done a series of light drawing by sketching with a flashlight in a dark room. They have produced a series of photographs containing a self-portrait of Picasso and loose light drawing. Of all these light drawings, “Centaur” is the most well known piece. Mili described these light drawings as “instant Picasso” because they vanished as soon as they were born. Mili further addressed the difference between Picasso’s light drawing and a doodle in appearance, “this rendering is an unimpeded expression of the artist’s inner vision, and as instinctive as one’s gesticulations in trying to make a point.” To the present day, many artists are still exploring this light painting technique. These light paintings are not only representative of an artist’s creative mind but also the tangency of body movement.
With the advent of digital age, Kurgur has always intended to change the way people interact with a computer. In 1977, Krueger created a virtual space for users to interact with and respond to a visual image. Krueger’s *Metaplay* project was the first time an artist was able to draw digitally in-air with free hand movement in real time. His system is quite flexible: a user is able to draw with fingertips or the whole body; the drawing application provides the user with the flexibility to draw with loose lines or simple geometric shapes; when the user rubs what has been drawn, the computer is able to recognize the gesture and erase the specified part.

After completing his virtual reality experiment, he pointed out the potential benefits of applying the virtual environment to psychology and psychotherapy. He noted that a virtual environment can monitor a participant’s actions through visual and audio feedback. Therefore it is natural to study human behaviour in a virtual environment. He further illustrated how a computer can aide an experimenter, “The use of the computer allows an experimenter to generate patterns and rhythms of stimuli and reinforces. In addition, the ability to deal with gross physical behaviour would suggest new experimental directions.”(Krueger, 1977, p. 10). Furthermore, it is easy to use computers to collect data or statistics without interfering in the user’s experience. Researchers believe these points of views are crucial to the people who want to study human behaviour and psychology by interacting with a computer.

Basically, contemporary motion-sensing drawing tools can be classified into two types of user interfaces. The first one is a tangible user interface (TUI) that requires manipulating tangible objects, such as mouse, to create input. Most of the shapes of such physical objects are similar to traditional drawing tools and provide users an intuitive way to use the tool such as the I/O Brush and Wacom Tablet. By moving tangible devices in 3D physical space, we can create lines, shapes and patterns.

The other type is a kinaesthetic user interface (KUI). A KUI utilizes the concept of a user’s body as controller. The way Krueger used his fingers to draw in 3D physical space can be categorized as a KUI.

Under the umbrella of TUI, motion-sensing drawing device relates to Spatial Interaction. As Harneck and Buur described, “Spatial Interaction refers to the fact that tangible interaction is embedded in real space and interaction therefore occurs by
movement in space” (Hornecker & Buur, 2003, p. 3). When moving their bodies or objects in space, humans create meaningful actions and make connections in the surroundings during the interaction. Another advantage of Spatial Interaction is to engage users’ full repertoire of body movement in interaction, “Interacting in real space furthermore has the potential to employ full-body interaction, asking for large and expressive, skilled body movement” (Hornecker & Buur, 2003, p. 5). These qualities of spatial interaction clearly can encourage clients to express themselves and communicate with others in art therapy sessions. Moreover, Spatial Interaction facilitates art therapists’ observing a client’s psychological state. Eva Hornecker and Jacob Buur illustrated, “Spatial Interaction also allows us, by moving in it, to make use of our entire body, it enables observation and thus implicit awareness as well as explicit performance.” (Hornecker, n.d.)

The first example of a motion-sensing drawing tool is Jürgen Scheible and Timo Ojala’s MobiSpray project which combined light art and environmental art. With a personal mobile phone, a PC, and a projector, artists were able to paint anytime, anywhere and on any surface in real time. By turning a mobile phone into a digital spray can and projecting the image on large-scale objects can liberate the artist’s desire to change their surroundings in an ephemeral manner. It is spontaneity & massive scale, “I like that it is not premade content to view.” “This has been the biggest picture I’ve ever painted in my life.”(Scheible & Ojala, 2009, p. 6). Because the tool allows the artist to draw or compose directly on the object itself, Jürgen Scheible and Timo Ojala claimed that “This is a form of embodied interaction where the artist’s interaction with physical objects is augmented by computational abilities”(Scheible & Ojala, 2009, p. 7). An interesting phenomenon appears after finishing the painting, the artist mentally feels his ownership of the physical object. This project explored how to use spatial interaction to mix virtual reality and the physical world. When spectators gathered and commented about the installation artwork, the project also generated a social setting.

Other motion-sensing tangible drawing tools examples are Surface Drawing (Schkolne, Pruett, & Schröder, 2001) and Cave Painting (Keefe, Feliz, Moscovich, Laidlaw, & LaViola Jr, 2001). Surface Drawing is designed to allow a users’ hand movement to create a 3D sculpture. The hardware components include a Responsive Workbench and a Cyber Glove. The system allows users to sketch, draw and scale.
Here are few impressions after artists tried the system “To see abstract images pour like water from my fingertips is sensational”, “Even more amazing is to see what touch looks like!”

The Cave Painting system presents a four-walled immersive virtual environment with physical props. The space allows users to move their bodies freely and paint in large space such as a traditional art studio. The cave includes a series of cups, a bucket, a brush, a knob and goggles. Through the goggles, users can see a virtual world and the real world at the same time. Thus users are able to paint using 3D movement and observe the artwork as a 3D sculpture in real time. Using physical props such as dipping in a cup for changing brush types, using a bucket to splash painting on the wall provides users an intuitive way to understand the concept.

In a user study of Cave Painting, most users found that movement is an essential component of this new medium and they enjoy creating artworks through whole body movement. They also like to see their artwork in an immersive 3D environment. However, some artists report that it is hard to draw accurately in 3D space especially when drawing in detail or lining up brush strokes. Another opinion is that there is no way to move the finished painting around. Keefe and his team also pointed out that it is a very different experience compared with looking at a final art piece in 2D form and watching the process of drawing. While in the cave, users are able to walk through the artist’s work and watch dance-like movements. He further stated, “It is really essential to get a feel for the depth and dynamic nature of the scene and the new way that art is created around an artist with this way of working.”(Keefe et al., 2001, p. 8)

In addition to sensing devices and hand-held drawing device, the frontal infrared illumination system project Body-Brush (Horace H. S. Ip, Young, & C. C. Tang, 2002) allows users to draw using simple gestures without any attachments. The immersive environment captures the speed and acceleration of motion as well as the body’s trajectory. By mapping body motion to visual elements, Body-Brush turns the whole human body into a dynamic 3D brush in the real time. Because it is a preset environment, users are not required to learn any special skills in the painting process. The abstract 3D painting is projected onto a canvas. With the function to encourage users to move their entire body, this project is currently being applied in the field of art.
therapy as a tool for children to warm up. This research claims, “The body, acting as a paintbrush, can be seen as a unique process of accessing one’s internal world, as it can help a client get in touch with emotional material through kinaesthetic movements.” (Horace, 2011).

Zero Touch (Moeller, Kerne, & Damaraju, 2011) is another recent study which allows users to draw in-air without any attachments. An intangible canvas was built by attaching a dense array of infrared LED sensors around a picture frame. This interactive remote canvas allows a user to use fingers and hands to draw through the sensors. While a user is drawing, he/she is able to see the projected drawing on the wall through the picture frame. An iPad was used for the colour palette and opacity selection. According to the evaluation, most users found it fun. However, users did wish to have more features and controls. Another comment was that painting in-air lacks tactile feedback. Thus users could draw unintentionally with other parts of the hand or fingers. In addition, this study compared two drawing conditions, free-in air and tabletop. Five out of seven participants found that the tabletop method was easier than drawing in-air because of the tactile feedback from the table.

<table>
<thead>
<tr>
<th>Study</th>
<th>Body parts</th>
<th>Tangible</th>
<th>Markerless</th>
<th>Output</th>
<th>Purpose</th>
<th>Record - able</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Whole body</td>
<td>✓</td>
<td></td>
<td>Projected 2D drawing on environment and buildings</td>
<td>Installation art</td>
<td></td>
</tr>
<tr>
<td>Cavepainting</td>
<td>Whole body</td>
<td>✓</td>
<td></td>
<td>3D painting in a immersive environment</td>
<td>Art</td>
<td>✓</td>
</tr>
<tr>
<td>Helma</td>
<td>Whole body</td>
<td>✓</td>
<td></td>
<td>3D painting in a immersive environment</td>
<td>Art</td>
<td></td>
</tr>
<tr>
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<td>✓</td>
<td></td>
<td>3D sculpture in a immersive environment</td>
<td>Design</td>
<td></td>
</tr>
<tr>
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<td>Whole body</td>
<td>✓</td>
<td></td>
<td>Projected 3D abstract painting</td>
<td>Art therapy</td>
<td></td>
</tr>
<tr>
<td>Zerotouch</td>
<td>Finger and</td>
<td>✓</td>
<td>✓</td>
<td>Projected 2D drawing</td>
<td>Art</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Taxonomy of contemporary computational motion-sensing drawing tools.
When reviewing these motion-sensing drawing tools, the researcher found that tangible props and objects provide a user with an intuitive way to manipulate the tool. Nevertheless, a tangible user interface can also restrict a user’s body movement. For instance, the fact that a user must hold a pen to use it results in limited finger movement. The user’s motor skills will also affect the sophistication of the movement. Some surveys also indicate it is more difficult and elusive to draw in air with 3D whole-body movement than on a flat surface. However, liberating the user from fingertips in a two-dimensional space to the full body movement in 3-D should ensure more gratification and freedom of self-expression.

It is noteworthy that among all the motion-sensing drawing devices, only one project, Body-Brush, is found related to the field of art therapy. This reflects the fact that there is little HCI studies have considered including human body movement into the field of art therapy. In the Body-Brush system, the size, colour, and thickness of stoke are coupled with users’ body movement and position. The advantage of this presetting system is that users can dive in the environment and explore the visual effects with body movement. Nevertheless, the drawback is that users cannot choose brush types and colours. In art therapy sessions providing clients options can enhance clients’ sense of control. In addition, not providing options for clients this could be an issue when art therapists want to observe and interpret colour, shape, strokes and texture according to the client’s artwork. Allowing users to choose drawing instruments and colour should be a fundamental feature for users to create a symbolic or meaningful drawing. Furthermore, Body-Brush does not provide the function which allows users to draw symbolic shape and form. Without this ability therapist would be difficult to observe clients’ cognition level.

Although current motion-sensing drawing devices are far from ideal for art therapy, the rapidly changing technologies is likely to be catalytic to the birth of an effective therapeutic drawing tool. Motion-capturing technology has been employed in animation production and for analyzing human movement since the 90’s. With the contemporary development of low cost motion-capturing technology, Kinect and Wii, it is relatively easy and inexpensive to create prototypes to experiment in this area. For example, in Johnny Chung Lee’s Wii experiment (Lee, 2008), he has created an electronic white board, head tracking glass and finger tracking device from a Wii remote. With the Kinect, whole body interaction and natural gesture interface drawing have
caught interactive designers’ attention for non-gaming purposes. Additionally, markerless motion-capturing technology provides a natural environment for artists to draw freely, to enrich the interaction and expand the repertoire of body movements in the drawing process.

In short, while reviewing the computational drawing tools related to art therapy, the researcher can only find one device serving therapeutic purpose: BodyBrush. However, it lacks some functions such as colour and brush selection, which are essential for art therapy. The majority of motion-sensing drawing instruments are primarily designed for entertainment or art purpose. They are either limited to hand movement or lack recording function. With the easy access to digital media, future interactive designs should consider integrating recording function into the drawing device for recording the process of drawing.

The goal therefore is to determine the most important features required for the clients, who the major target clients are and how to design the prototypes for contemporary art therapists. A further goal is to categorize kinaesthetic user interface, design specific features according to different user scenarios and drawing exercise in the art therapy context.
Chapter 3.

Goals and Approaches

Despite the fact that little research has related full-body drawing movement to mental health therapy, the existing theories shown in the previous chapter indicate that full body drawing movement can be valuable as an aid to patients’ expression and therapists’ observation in art therapy sessions.

3.1 Research Goals and Approaches

The motivation behind the research can be stated as three parts. The first goal is to explore digital interaction based on the concept of combining two nonverbal forms of communications, art and movement. A kinaesthetic drawing prototype is accordingly designed to enhance clients’ ability to express inner feelings and to aid an art therapist in observing a client’s psychological state through whole body movement.

The second goal is to build a design framework for other researchers to design kinaesthetic drawing tool in the future. The author intends to explore the possible design features and establish a design vocabulary bank for researchers and art therapists. With adequate connected knowledge and vocabulary, researchers can further evaluate and develop the system in the future.

The third is goal to investigate the use of a kinaesthetic drawing tool in art therapy practice. Investigating how whole body movement can help achieve therapeutic goals. Who can benefit from this tool? And which design features can be used for specific populations?
3.2 Research Goals

3.2.1 Explore Digital Interaction Based on the Concept of Combining Art and Movement.

The idea of applying cross modalities for therapeutic use can be found in the realm of expressive therapy. Therapists often combine a wide variety of art forms such as drawing and painting, dance, drama, music and poetry in the creative process. For example, a therapist may introduce music during the drawing process to observe its impact on the drawing in the making. Traditionally, therapists may ask clients to focus on breathing and body posture in order to relax before drawing to show clients how their energy level can impact on their psychological state. By the same token, this research is intended to create a platform allowing clients to experience whole body movement and draw at the same time, which results in a more comprehensive picture to reflect a client’s state of mind and energy level.

In order to provide a kinaesthetic drawing tool for contemporary art therapy office, the author attempted to integrate body movement and drawing with current motion-sensing technologies. Among the myriad of motion tracking devices in entertainment industry, the author is notably impressed and inspired by Chong Lee’s Wiiremote project. The author intended to turn low-lost motion-sensing devices into a drawing tool with special features to involve body movement. It is expected by enhancing clients’ drawing movement, clients are to express themselves creatively.

3.2.2 Establish Design Framework for Other Researchers to Design Motion-Sensing Drawing Tool in the Future.

In order to understand how interactive design can function in the art therapy context, the author maps art therapy process with digital interactive process. Consequently, other researchers can understand how to and evaluate the drawing system or innovate a tool catering to the needs of art therapy.

Normally digital interaction process involves input, system and output. In the context of art therapy session, the input could involve therapist’s instruction, client’s physical or mental condition and client’s treatment. In the process of drawing, clients use
motion-sensing digital drawing tool to draw with free body movement. It is also a transformation process for clients to explore emotion and inner word in the therapy session. The output of this drawing tool is aimed to facilitate art therapists’ observation and foster relationship between clients and art therapists. For the purpose to create a design framework, the author categorizes this drawing system into four aspects, body movement, visual effect, user interface and interaction. The research goal is to further explore all the possible features and establish a word bank between designers and therapists.

<table>
<thead>
<tr>
<th>Input</th>
<th>System</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients</td>
<td>Art therapist</td>
<td>Clients</td>
</tr>
<tr>
<td>User issue</td>
<td>Art therapist’s instruction</td>
<td>User’s input</td>
</tr>
<tr>
<td></td>
<td>Body movement</td>
<td>Visual effect</td>
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<td></td>
<td>Interaction</td>
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Table 3. Mapping between art therapy process and digital interactive process.

3.2.3 **Investigate the Use of a Motion-Sensing Drawing Tool in Art Therapy**

It is the author’s intention to investigate how this new type of drawing tool can aid art therapists in achieving their therapeutic goals. Who can benefit from this drawing tool? What drawing exercises will art therapists create based on this drawing tool? What specific design parameters should be used for different clinical cases? (Further details will be covered in chapter 5.)
3.3 Research Methodologies

3.3.1 Exploration Process

The author adopts the exploration design method to conduct the research for the first part of the work – namely designing the tool. The pivotal part of this method is asking “What if?” question to collect relevant and adequate information. As a valuable design is often a result of a trade-off from various objects. It is a divergence design approach to explore possibility and constraints of kinaesthetic drawing tool for therapeutic usage.

To investigate the concept of combining art and movement, the author attempted to discover which technologies and techniques provide the best ability to enhance users’ drawing movements. During the process, the author developed a series of motion-sensing drawing prototypes. The goal is to induce the full repertoire of a user’s body movement in the drawing process and to select the movements and include them into clinical practices.

Based on the module nature of digital media, the author is able to integrate different design features with therapeutic potential into the system. The author also determines parameters that can influence a user physically and emotionally during the drawing process. By further experimenting with these design parameters, the author can better identity the benefits and constraints of motion-sensing drawing tools.

While working on the prototypes, the author directed the design process toward an open-ended result without any preconceived preference over particular parameters. The prototypes have been made with public open sources and devices such as a webcam, a Wii remote and a Microsoft Kinect (Microsoft, 2010). In order to share the knowledge with therapists and other designers, the author documented the design process to help keep open other avenues to apply new technologies in the practice of art therapy.

3.3.2 Expert Interviews

In order to better understand the potential uses of motion-sensing drawing tools in art therapy, the author has adopted a qualitative approach and conducted semi-structured expert interviews. The questionnaire includes both open questions and closed questions.
Given that art therapists aim to cope with a wide range of clients’ personal problems, the author has chosen one-on-one interviews in the hope to gain insight into specific clinical case findings. The duration of each interview is 45 minutes to one hour. On average, the art therapists participating in the interview have been practicing for fourteen years. During the interviews, the researcher took notes and taped the conversations.

The primary purpose of the interviews is to learn what basic design parameters art therapists would consider essential for a therapy session and to find out how movement can add value to the practice of art therapy from an expert’s point of view. Based on the final prototype, the author then categorized all the possible design parameters for a kinaesthetic drawing tool and creates a knowledge matrix and had it validated by expert art therapists via the questions. The second purpose of the expert interviews is to determine the design parameters for specific kinds of clients and the type of drawing exercises art therapist would utilize with the drawing tool with reference to the knowledge matrix framework. Based on the outcome of this exploration process, the author is to devise a set of usage guidelines for clinical practice. Details and materials used for the qualitative interviews are in Appendix A: Interview Procedures, Appendix B: Interview Questionnaire and Appendix C: Design Matrix Framework Chart. Additionally, a four-minute video demonstrating the live use of the tool was part of the interview materials.
Chapter 4.

Exploration Design of a Motion-Sensing Drawing Tool

This chapter is to review three motion-sensing drawing prototypes, which will be of interest to interactive designers and art therapists. These examples demonstrate how to convert computer devices and sensors into a kinaesthetic drawing tool. The three sections included in this chapter are organized in a chronological order to illustrate the evolution of the prototypes. The end of this chapter will detail the advantages and drawbacks of applying these motion-sensing drawing tools to art therapy.

4.1 Blob Tracking Prototype

Blob detection denotes a visual system that is able to detect specific regions in an image. These regions have properties different from the rest of the image. The properties can be about colour or brightness. This is the first method the researcher adopts in the exploration design process. The goal for this prototype is to explore the potentiality of drawing in air. It is the researcher’s intention to extend the implications of body movement to the digital drawing process. Furthermore, the researcher attempts to explore the potential of integrating various art forms, such as drawing, dancing and music, by using this drawing tool.

In should be noted that one parameter the research focuses on is to design an affordable drawing tool by accessing common computer devices. The hardware for this prototype includes a laptop and colour objects. The drawing application is built in an open source programming environment. The system is able to detect the colour from a built-in webcam. With this blob detection method, users can use any found coloured object as a motion-sensing drawing tool.
The researcher uses a blue glove to distinguish the colour blue from his own skin tone, clothes, and the background. The glove provides a user the equipment to move his or her fingers freely in the air. To activate the system, the user moves his or her hand to the corner of the (webcam) monitor, and the camera picks up the blue colour from the screen. The system then analyzes the chosen colour and draws a bounding box around the chosen pixels, which the user confirms visually. (See figure 7.). The system allows users to choose up to two colours at the same time.

This prototype provides users with three types of strokes: ellipse, 2D ribbons, and random strokes. When a user chooses the ribbon stroke (figure 9. and 10.), he or she is able to control the flow of ribbons and particles with a simple hand movement. The ribbons indicate the direction of movement, the speed of the gesture, and the tangency of the flow. The ribbons provide users with a great sense of three-dimensional movement and engage users in interaction because of their vivid life-like form. Users can experience augmented reality by viewing their own image and the ribbons they produce in the monitor screen (figure 9.). Unlike the ribbon stroke, the random stroke (figure 12.), is represented by two lines from a random location to the current tracking position. When users are moving on the camera, the computer plays random sounds and notes. Hence, the random stroke provides users with a synchronized experience by connecting movement and musical notes.

*Figure 7. A screen shot of colour detection mode.*
The major drawback of this prototype is that the colour detection function can be very sensitive to ambient light, reflection and background colours. In addition, it only allows users to draw with a continuous line. As a result, this prototype can only produce abstract drawings. This prototype does not include the function “start” or “stop” during
the drawing process. Furthermore, lags occur when computer fails to process videos at a high frame rate.

The advantage of this prototype is the use of tangible objects to establish colours and it is relatively inexpensive. With a simple laptop webcam, art therapists can turn any coloured object into a tracking point. These objects can be coloured clay, colour taped, coloured fabric, etc. By attaching coloured objects to body parts or by holding coloured objects, clients are able to utilize their body freely at a distance from the webcam to create art. Consequently, a client’s drawing movement is no longer limited by the size of tablet or piece of paper.

4.2 Tangible Motion-Sensing Prototype

The researcher’s next move is to resolve issues such as over-sensitive colour detection and lack of sense of touch in the first prototype by making a tangible motion-sensing drawing tool. The primary goal is to create a tracking method more independent of the environment. The second goal is to create a method to activate the stroke. The concern in this exploration process is to provide the user with a stable system featuring a friendly interface. Based on the improvement upon Johnny Chong Lee’s Wiiremote project (Lee, 2008), the researcher has created an infrared LED pen for drawing in-air. The components of this prototype include a laptop, a Wiiremote, a homemade IRpen and a video projector.

In order to prevent interference from ambient light, the researcher chooses to experiment with infrared devices, the Wiiremote and the IRpen. Wiiremote is a low cost motion-sensing device for home entertainment purposes. In general, infrared light cannot be seen by the naked human eye, but it is visible to the Wiiremote. Thus under different lighting condition, the Wiiremote can still sense infrared light accurately. Based on this reason, the researcher uses the Wiiremote to detect the infrared light emitted from the IRpen.

In order to facilitate a users’ operation, the researchers has built an IRpen with a normal plastic pen tube. The familiar physical shape helps minimize the mental work for users because they can intuitively grasp how to use the instrument. The IRpen basically consists of a pen tube, an Infrared LED, an AA battery, and a button (figure 13.).
Figure 13. IR pen.

Operation is easy. When a user presses a button, a cursor appears on the screen. By calibrating the four corners of the screen, users are able to define the size of their canvas in the air. This calibration method provides users with the ability to decide the range of movement. When users double click the button on the IRpen, the drawing process is activated. By holding on the button, users can make continuous line work. After releasing the button the stroke stops registering. During the drawing process, an image is projected on the screen, which allows the user, standing, to manipulate a huge image over a long distance. In this way, the user is given the ability to express feelings through the dynamics of body movement.

Figure 14. A doodle done by a researcher.  

The Wiiremote and tangible IRpen show promise as motion-sensing tools. Under different light conditions, the Wiiremote is able to track the infrared strokes precisely. With this advantage, this drawing tool can easily be adapted to different office settings. The physical shape of the pen also allows the user to draw intuitively. Simply pressing the button on and off fulfils the need of tactile feedback. In this way, users are able to control line accurately in-air. In addition, the researcher believes that the calibrating
function will be useful for art therapists to approach various therapeutic goals by framing parameters for the client’s movement space.

Moreover, by installing a pressure-sensor switch in the tip of the IR pen, users are able to draw on a table and project an image. With the table contact, the tool can provide even more tactile feedback during the drawing process. Thus art therapists can have the option to have clients draw in-air or on a surface. The drawback of this prototype is that holding the pen limits a user’s finger movements. As a result, users cannot rotate their wrist freely. In addition, glitches may occur when users do not hold the pen toward the Wii remote. Markerless Motion-Sensing Prototype

4.3 Markerless Motion-Sensing Prototype

In order to provide a user the facility to move freely without holding any tangible devices or attaching any sensors to his/her body, the researcher has been attempting to investigate the possibility of applying markerless motion-sensing technology to the drawing activity. With the collaboration of another SIAT graduate student Chao Feng, the researcher is further exploring the concept of the body as a painting tool by using the low cost sensor Kinect made by Microsoft (Microsoft, 2010). The researcher was the main designer of the tool, whereas Chao Feng was the main programmer (as a paid Research Assistant (RA) of Senior Supervisor DiPaola). Supervisor DiPaola and Chao Feng spent many hours discussing with the researcher and contributed secondary design ideas.

The hardware of this markerless motion-sensing system consists of a laptop, a Kinect and a display device. The display device can be a TV or a projector. The software includes an open source graphic coding program called Processing and a middleware program OpenNI. The Microsoft Kinect is typically used as a Motion-Sensing family game controller for the Microsoft XBOX 360. With it (Kinect), the user is able to move freely without attaching any sensors to the body. When a user stands in front of a Kinect in a surrender pose, the Kinect can automatically detect the user’s body shape and position through its infrared camera. The users on-screen figure will turn blue once his/her body is tracked. The system is able to detect up to five users and label them with five different colours. In addition, the system can turn a human figure into a simple stick.
figure, skeleton model. In this research context, the Kinect was used via the aforementioned setup with a laptop computer.

![A user is detected by Kinect.](image1)
![The system is able to identify up to 5 users.](image2)

Figure 16. A user is detected by Kinect.  Figure 17. The system is able to identify up to 5 users

The size of our physical environment setting is 350 cm (Width) X 270 cm (Length). Kinect’s motion-sensing range is from 120 cm to 350 cm. Within this range, a user’s movement can be captured. In order to help the user be to aware of the space available in which movement can be captured, the researcher uses masking tape to create borders. The physical setting is shown in figure 18 and figure 19.

![A user in a physical setting.](image3)

Figure 18. A user in a physical setting.
With the goal of providing users with an easy-to-understand drawing method, the researcher has explored the concept of an intangible canvas (figure 20.) based on the concept of a touchless surface. This original contribution allows the system user to easily move from drawing mode where their hands are tracked and are always creating strokes, to not drawing where the hands are free to move freely without worrying about “wreaking the picture” with unintended strokes, by simply stepping back and breaking this plane of our intangible canvas. Other typical virtual painting systems require the user to make a more vertical or horizontal physical moves with their hands, to stop the drawing mode. These typical moves including clapping, moving hands to the side or bottom menu, which often leading to confusion and overlapping strokes that were not meant to be laid on the virtual canvas. By moving forward to break the plane and be in drawing mode, and stepping back to be in non-drawing mode in our method, there are limited unintentional stroke marks and a very intuitive way to step in and out the intangible canvas to draw.

This intangible canvas was developed on the basis of the user standing 2 meters away from the Kinect. This intangible canvas is achieved by setting up a 2D canvas based on the virtual space projected on a screen. When a user moves into the
drawing zone (figure 21.), the tracking point will turn yellow and start to draw. When a user moves out of the tracking zone, the point will turn green and stop drawing. In the tracking zone (figure 22.), a user can use the tracking point as if it were a normal cursor on computer screen. The reason for changing the colour of the point is to remind users which zone they are in on the screen.

In addition, this system encourages users to explore various degrees of body movement while drawing. The movement range in the system includes tight, medium and large. The movement range is independent of the canvas size, and it is the body movement needed to draw a stroke from one side of the canvas edge to the other. Within the tight setting, the user is able to draw across the screen with simple arm length hand gestures. The width of the tight movement range is 3 feet (either metric or imperial measurements). Under the medium setting, the user can draw a cross on the screen with whole body movement. The width of the medium range is 6 feet. Under the large...
setting users have to move their feet with extensive body movement to draw a cross on the screen. The width of large movement range is 9 feet. This feature is designed for users to experience various levels of movement. Further, with the function to control the movement range, the system is able to adapt to various office sizes. These parameters are described in the first row of the Matrix Chart (Appendix C).

In order to tap the full repertoire of body movement, the system is equipped with the feature to allow users to draw with various body parts. This feature is achieved by assigning strokes to different parts of human frame. So far the system provides users the ability to draw with one hand (figure 26.), two hands (figure 27.) and the head (figure 28.). These parameters are described in the second row of the Matrix Chart (Appendix C). Based on these 3D body movements, a user’s artwork is presented as a 2D drawing on screen. It is expected that users will be able to create artwork with little effort.

![Figure 26. One hand](image)
![Figure 27. Two hands](image)
![Figure 28. Head](image)

With a view to enabling users to easily adapt to a kinaesthetic user interface, the researcher utilizes the corner of screen for the command interface. When both hands close to the corner, a red square appears. Using gestures to move two cursors inside the square, users can clear the screen, change strokes and save images. In addition, users can put their hands together to confirm their selection, which is to add a tactile element to the process. It is hoped that this tactile feedback will reinforce the confirmation process. When not in use, the interface is hidden to enable users to focus on the drawing process. The researcher has also explored the idea of using sound as part of the command process. This is accomplished by making a loud clapping sound trigger a full-colour palette on screen. To change colours, users simply use the right
hand to select the colour they want, and then move the left hand toward the right hand to confirm the selection.

**Figure 29. Layout of interface**

**Figure 30. A user is using right top corner to change stroke type**

**Figure 31. Clapping to activate the colour picker.**

**Figure 32. The picked colour will show as a circle beside colour picker.**

With a view to the art creating process rather than the finished artwork, the researcher analyses how computer-generated strokes can aid therapists. The researcher integrates Memo Akten’s Msafluid (Akten, 2008) and James Alliban’s 2D-ribbon (Alliban, 2008) into the kinaesthetic system. So far the drawing system includes five stroke types: normal stroke, ribbon, fluid, smoke and normal stroke with spray effect. Under the normal stroke, when the velocity of a user’s hand movement is increased, the
strokes grow thicker. These parameters are described in the third row of the Matrix Chart (Appendix C). By coupling a user’s body movement with the visual effect of a stroke, a user is able to see the quality of a movement visually. The normal stroke is also the one inherited resistive property.

As resistive and fluid are basic components in Media Dimension Variables, the researcher adds fluid strokes to the normal resistive stroke in the system. Fluid strokes consist of a particle system that creates a similar effect to traditional water colours. Normally the colour of fluid stroke changes automatically in a random colour cycle. The shape of the fluid stroke can vary from solid to liquid-like form depending on a user’s drawing motions. With fast movements, a user can create an abstract form with intense particle motion on the canvas. These intense particles can also affect previously drawn images. These parameters are described in the fourth and fifth rows of the Matrix Chart (Appendix C).

The system also offers various parameters under fluid strokes such as the level of fluidity formed with the particles and duration of strokes. The duration of stroke is the time before strokes fade from the canvas. Users have to draw quickly to form an image before it fades away. The researcher believes this time restraint has the benefit of requiring users to draw following their instincts.

In addition, in order to aid users in loosening up their physique, the researcher provides a ribbon stroke that encourages users to perform warm up calisthenics. When the interface is not in the drawing model, the ribbon will automatically follow a user’s body movement. The current design allows users to control the number of ribbons, the thickness of the ribbon and the behaviour of the ribbon. The behaviour includes calmness and wildness. The reason for adapting the behaviour feature is to engage a user’s emotions during the warm up period. The author has also created smoke stroke and spray stroke with a quick rapid prototype approach.
Figure 33. Fluid stroke fade out short

Figure 34. A abstract painting is made by ribbon stroke

Figure 35. Normal stroke with spray effect.

Figure 36. Smoke stroke

Figure 37. Fluid particle is affected by the drawing movement.

Figure 38. Fluid stroke with long-duration fade out.
Apart from helping users express themselves visually and physically, the author is also expecting this drawing tool can work as a mirror to aid art therapists in collecting psychological data during art therapy sessions. The system is designed to automatically record both the chronological progress of a drawing and track the user’s body motions in a separate video recording; these parameters are described in the interface and interaction rows of the Matrix Chart (Appendix C).

It is hoped that the video will help reveal a user’s psychological state and that the therapist will review both the drawing and the video with the client.
While developing the prototype, the researcher used the tool to create several types of artworks. It is noted that, when users are pulling their hand away from the touchless canvas, they can create small glitches on the screen. This is because the body moves naturally in a curve trajectory. It is difficult to pull the hand away from drawing zone with a direct movement. However, even under these restrictions, the researcher still can write his name with precise hand movements. The researcher also can draw some symbolic images such as fish and human faces with normal stroke. The ribbon strokes especially work well for background work and abstract Pollock-style paintings.
Figure 47. A Pollock-style painting was created with ribbon strokes.

Figure 48. Researcher was trying to write his name.

Figure 49. A face was created by doodling

Figure 50. A face was created by doodling

Figure 51. A doodling piece

Figure 52. A doodling piece
After reviewing these designs, the researcher is to further explore how a motion-sensing drawing tool can be applied in the field of art therapy in collaboration with Vancouver Art Therapy Institution and other experts.

4.4 A Matrix of Design Features

Based on the exploration design process and nature of a kinaesthetic drawing tool, the author has created a matrix framework chart defining all the major features and components into understandable categories for art therapy purpose. The four major categories are movement, visual effect, interface and interaction. These categories concern how users use their body and senses in the process of creating visual artwork and how art therapists can use this tool to observe a user’s psychological state. The matrix involves the scope of a user’s body movement, the characteristics of visual stimulation and the intensity of engagement. The author hopes these features can play a role in enabling users to experience freedom or constraint to varying degrees with regards to physical level, emotion level, cognition level and creative level. Providing freedom and constraint further aids therapists to achieve therapeutic goals in the drawing process. The main goal of the matrix framework is to define the parameters in a more rigorous language that accurately and academically describe all possible axes of the research scope. This matrix or agreed upon formal language can help art therapists and researchers better define the tool set, user scenarios and best practices for the emerging field integrating digital interaction with art therapy.

After categorizing these design features, the author discussed the matrix with supervisor Steve DiPaola and researcher Chao Feng to add extra design features that could benefit art therapists and clients. In order to verify this matrix the author presented and discussed it with art therapist Jerry Stochansky, movement expert Pat Subyen, psychologist Liane Gabora (UBC) and the faculty of Vancouver Art Therapy Institute. The author will briefly illustrate each major category in the following section. In the matrix chart, the section with “**” mark means that the design features under this section can be applied more than once in the system. The full matrix is presented in Appendix C.
Movement

The movement category involves the design features that could influence a user's physical body movement in the drawing process. These design features are divided into movement range and body parts. Movement range affects the way users move their body from small effortless movements to large difficult movements. The variety of movement range is not only intended to assist people with physical limitations but also to engage users to coordinate various body parts. The body parts section determines which body parts can be used as a drawing tool. By emphasising the connection between strokes with particular body parts, the system is designed to help users increase sensibility of their body parts.

<table>
<thead>
<tr>
<th>Movement range type</th>
<th>Large (Width 9 feet)</th>
<th>Medium (Width 6 feet)</th>
<th>Tight (Width 3 feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body parts *</td>
<td>One hand</td>
<td>Two hand</td>
<td>Head</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One leg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Two legs</td>
</tr>
</tbody>
</table>

Table 4. Movement category

Visual Effect

The visual effect category involves the visual stimulation which is provided by the various characteristics of strokes. Under this category the author divides characteristics of strokes into three sections, stroke types, stroke life period, and stroke effect.

The stroke types include traditional stoke tips which are based on mimicking traditional art materials. Other strokes include normal strokes, ribbons, fluid, smoke and normal strokes with spray effect which are created within the prototype. The idea of body paint is similar to finger painting. However, other than using their fingers, users are able to use any part of body to paint directly on the virtual canvas. Paint ball is a feature that allows users to throw paint onto the screen. When a paint ball hits the canvas, the paint ball creates a splattered effect on the screen. This wild range of stroke types provides
users the freedom to choose from simple normal strokes to intricate algorithmically generated strokes.

The stroke life span section affects how long a stroke stays on the screen. The setting of stroke life span includes permanent, fade out long and fade out short. The duration can influence the way a user depicts a picture. When the stroke fades out quickly, in order to complete their intended image, users have to draw with their instinct under time pressure. This setting can be an intervention to urge users to creative doodling.

The stroke effects are the design parameters that can affect strokes visually. Under this section in the prototype are stroke behaviours and thickness. The particle system, such as fluid strokes, is also categorized in this section because the particles can influence each other based on the velocity of the drawing motion and the direction of drawing motion. Thus, sometimes, the drawn image can also be affected by the next drawing movement even if it is not aiming directly on the drawn image. In addition, the numbers of particles and the way the particles move can also be programmed differently.

<table>
<thead>
<tr>
<th>Visual effect</th>
<th>Stroke types*</th>
<th>Stroke life span</th>
<th>Stroke effects*</th>
<th>Body paint</th>
<th>Paint ball</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional stoke tip</td>
<td>forever</td>
<td>Transparency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal Stroke, Ribbon, fluid and smoke.</td>
<td>Fade out long</td>
<td>Thicker/ Thinner over time</td>
<td></td>
<td>Behaviours (Wildness, calmness...)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fade out short</td>
<td>Particle system</td>
<td></td>
<td>Effects past strokes/canvas</td>
</tr>
</tbody>
</table>

Table 5. Visual effect category

Interface

The interface category includes the colour palette section and recording/saving modes section. In order to comply with various therapeutic approaches and fulfill the needs of different client types, the author includes a full colour palette, fixed colour palette and an
auto colour function under the colour section. The auto colour feature means that users can not choose the colour. The colour of the stroke changes randomly in a cycle. The recording and saving mode provides therapists various ways to collect data. In the recording and saving section, therapists can choose to record a client’s participation on the scene and the process of drawing in video format. The save and label feature allows therapists to take note while they save single images. Thus therapists could keep running notes on a client’s feelings or the symbolic meanings of the image, and so on. Guided steps allow users to draw on different layers. For instance, after a user finishes painting a background with thick stokes, he is able to save the background as a layer then start working on the foreground. This “save in steps” feature is similar to the history function in Photoshop. This feature allows users go back to previous drawing steps.

| Interface | Colour palette | Fixed palette of colours (Primaries) | Auto colour (colour cycles on the fly) | Save and label | Guided steps (background then foreground, layer…)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording</td>
<td>Process of drawing</td>
<td>Client’s participation /body on the scene</td>
<td>Save in steps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 6. Interface category*

**Interaction**

Interaction involves how users interact with the system in an art therapy session. The author divides interaction into three sections: therapist interaction modes, methods for commands and embodiment. Art therapy sessions generally involve three situations. Clients paint alone, which gives him/her more privacy in the creative process. The second situation is that clients and therapists have a conversation during the painting process, which is very common especially when a therapist is trying to guide the client and interpret his artwork. The third situation is that the therapist and client paint together.

Under the methods for the commands section the author include voice, hand, standing distance and z movement. The voice command method allows users to use the
sound or voice recognition function to make a command such as change colour and clear the screen. The hand command method allows users to use hand gestures or the position of the hand to make commands. Standing distance is the method used in the prototype. By setting a touchless canvas interface between the Kinect and the user, the user is able to draw and control the interface right on this invisible canvas. The z movement involves movement in the third axis, such as a pushing movement to click a button.

The embodiment section involves characteristics of strokes coupled with a user’s body movement. For example, in the demo of the prototype, the author coupled the velocity of the body movement with the thickness of the normal stroke. Thus when the body movement is faster, the stroke grows thicker. An example of Fully-Embodied is Body-brush (H.H.S. Ip, Hay, & Tang, 2002). Under the presetting environment users can dive into a playful creative model quickly without choosing colour or stroke. The author’s kinaesthetic tool is related to Semi-Embodied which allows users to pick colours and stroke types. At the same time, the velocity of body movement is coupled with the characteristics of the stroke chosen.

<table>
<thead>
<tr>
<th>Interaction</th>
<th>Therapist interaction modes</th>
<th>Methods for commands*</th>
<th>Embodiment</th>
<th>Therapist interaction modes</th>
<th>Methods for commands*</th>
<th>Embodiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint alone</td>
<td>Voice</td>
<td>Hand</td>
<td>Fully-Embodied</td>
<td>Standing distance (touchless canvas)</td>
<td>Semi-Embodied</td>
<td>non-Embodied</td>
</tr>
</tbody>
</table>

Table 7. Interaction category

To ensure the validity of the prototype and sustainable development of this research, the author not only aspires to make the best system which meets the needs of the art therapists, but also intends to build a common language for both practitioners and other researchers within this new field. As described in the beginning of this section, the
full matrix framework (Appendix C) went through several levels of iteration and validation. The local researchers and supervisors had worked months on the early development and early iterations. The prototype was then more fully validated with an hour long full demonstration of the tool, once with Jerry Stochansky (B.Sc., B.F.A., D.V.A.T.I., RCAT) a well-established Art Therapist who runs “SAFER Mental Health” for Vancouver Coastal Health and a second time with University of British Columbia psychologist and creativity theorist Liane Gabora. These two sessions locked down and validated the final pre-study matrix, which the author then presented along with the accompanying questionnaire to art therapists in the study. In the study the seven art therapists with an average of fourteen years of practice further validated the completeness of the matrix, which the author now believes will be a valuable tool for researchers and art therapists.
Chapter 5.

A Qualitative Study

This was a small-scale study of the application of human/computer interaction in a modality to enable contemporary art therapists to explore this kinaesthetic drawing tool as an aid to restoring mental health. A qualitative approach is adopted in this study, which means only the very relevant population, namely art therapists, were selected to participate in this research. Appendix E describes the art therapists who took part in the study, including their titles, affiliations, sub specialities and length of service as art therapists.

5.1 Goal of Study

The objective of this study is to discover how art therapists can use this motion-sensing device in an art therapy session to achieve therapeutic goals.

As an interaction designer, the author has always intended to create the best system, based on the improvements of current kinaesthetic drawing device. However, with the ultimate goal to apply this design to art therapy, it is essential to test this tool among the art therapists to learn the pros and cons, which will be seminal to the future design.

5.2 Tasks and Methods

The main goal of this study is to discover how this kinaesthetic tool can aid art therapists. Other subtasks in the study include finding out the answers to the questions as follows: who can benefit from this new drawing medium? How can whole body movement aid art therapists to achieve therapeutic goals? What design parameters can aid contemporary art therapists in art therapy sessions? What combination of design features can aid art therapists to deal with specific user scenarios?
The main approaches to this study include the researcher’s demonstrations to a keynote group of art therapy experts, one-on-one interviews and questionnaires.

A link on the video featuring the drawing device was e-mailed to the experts involved in the research during the recruiting process. During the demonstration the researcher introduced the prototype in an informal way with an actual demonstration. The author and experts then had a free-flowing conversation. On the day of interview, experts were first invited to observe the pre-recorded demonstration of this kinaesthetic device, which lasted about four and half minutes. After watching the video, interviewees were asked to fill out a simple questionnaire (See Appendix B.) which was designed to evaluate the prototype and explore its various usages. A questionnaire was designed by the researcher and distributed to the researcher prior to the interview session.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Author contacts experts and invite them to demo, distribute questionnaires.</td>
</tr>
<tr>
<td>2</td>
<td>Author shows demo video (The demo is only showing video, no on-site demo; neither the interviewer nor interviewees get to operate the device.)</td>
</tr>
<tr>
<td>3</td>
<td>Interviewers fill out questionnaires.</td>
</tr>
<tr>
<td>4</td>
<td>Author presents matrix chart.</td>
</tr>
<tr>
<td>5</td>
<td>Interview (One-on-one), note-taking, recording conversation.</td>
</tr>
<tr>
<td>6</td>
<td>Experts’ statements on potential applications of the device in specific situations</td>
</tr>
</tbody>
</table>

Table 8. Procedure of expert interview

The next step was conducting semi-constrictive 45-minute interviews with the same experts to collect relevant data. During the interview, the researcher took notes and recorded the conversation for further analysis. In the meanwhile, the researchers also presented a matrix of design features (See Appendix C.) which listed all the possible design features and categorized them into movement, visual effect, interface and interaction. In order to help
establish common ground, and better meet the need of art therapists, the researcher explained each possible design features in the matrix chart.

After covering each category the researcher led one-on-one interviews for any thoughts they had about these design features and what extra design features could be incorporated under each category. In the last part of the interview, the researcher asked the interviewee to think of three appropriate user scenarios for this tool and further identify the related design features needed for each scenario.

5.3 Participants

The main recruiting method is to email a link of a demo video and related description of this kinaesthetic tool to a list of potentially interested parties among the faculty of Vancouver Art Therapy Institute. The recruiting proceeded well thanks to the liaison of Tatjana Jansen, Chair of the Vancouver Art Therapy Institute. As a result, the author recruited local practitioners and instructors from Vancouver Art Therapy Institute, Vancouver Coastal Health and a private clinic. The expert interviews include seven experts in a small but varied group. Among this group, five experts have practiced art therapy for over fifteen years. One expert has practiced seven years. The final expert has practiced between 11-15 years. They are also specialists with various types of clients including those suffering from depression, grief and loss, attention deficit hyperactivity disorder (ADHD) and autism, cancer clients, and clients with suicidal inclination.
5.4 Hypotheses

Based on researchers’ design principles and previous literature review, the initial hypotheses of this study are as follows.

H1. Using this kinaesthetic drawing tool can help art therapists to raise a client’s emotional and creative levels by introducing body movement into the drawing process.
H2. Using this kinaesthetic drawing tool, a client will be able to focus on the process of drawing rather than the final product.
H3. The touchless canvas design feature can provide the materials-sensitive clients a safer environment to create artworks.
H4. The data gathered by art therapists with this digital drawing device are more relevant and reliable than those secured by therapists via traditional art media.

5.5 Results

In total, this study involved two demonstrations and seven expert interviews. For the first demonstration, the researcher invited Jerry Stochansky, mental health art therapist at Vancouver Coastal Health, to view the prototype at the SIAT VR lab in September, 2011. With his recommendation, the researcher contacted the faculty of the Vancouver Art Therapy Institute for further study. The second demonstration was held at the Emily Carr Art Institute in December 2011 and involved five art therapists from the VATI. In the demonstration, two art therapists have tried out the system. They are particularly impressed by the free body movement and computer-generated graphics while trying the tool out. And seven interviews were conducted in February and March, 2012. The results of the demonstrations and interviews are as follows.

Who Can Benefit From This New Therapeutic Drawing Tool?

During the interview, the art therapists pointed out a wide range of clients that can benefit from this tool. All of them showed high interest in applying this tool to their own specialty in the future.

According to the questionnaires, all therapists agree that people with physical disabilities are the biggest client group who can benefit most from the tool. For example, people in
wheelchairs would be empowered in the way they use their body to draw on this large screen. Another example is the seniors with arthritis who have difficulty holding a pen or picking up art materials. Using hand movements or voice recognition to command could help overcome the clients with similar disabilities.

The second major population is people with emotional problems and learning disabilities. The emotional problems could involve anger, anxiety, fear and depression. In general, the therapists agree this tool could be applied to all of the people above because body movement stimulates motivation. For instance, when dealing with people prone to anxiety, providing a safe and comfortable environment becomes art therapists’ top priority. Therefore, therapists might set this tool on the small movement range for the anxiety-prone clients and work side by side with them. For the clients with anger management issues the therapists suggest that clients use their torsos or two hands to draw with large body movements to release anger.

The third major population identified by art therapists is people with behavioural problems, including children with ADHD, children with autism or eating disorders. People with ADHD usually have difficulty controlling their impulse and maintaining attention. The therapists suggested that guiding the clients with ADHD to control their body movement would help them to learn how to control their impulse and behaviour. The large movement range setting is suggested to help them release energy in a positive way. For the clients with autism who are sensitive to contact with materials or getting their hands dirty, the touchless canvas is a great feature as it enables them to draw in a comfortable way. On the other hand, most clients with eating disorder are filled with a sense of disembodiment and may have low self-esteem. The therapists indicated that this kinaesthetic tool could aid such clients in reconnecting mind and body and building up confidence by increasing awareness of what their body can do.

For the people with learning disabilities, this kinaesthetic tool provides them with an exploration learning process, in which they try to figure out how to adapt to the system. Most of the therapists indicated that this tool could be of significant benefit for nonverbal clients. Often their clients tend to keep silent; adolescents make the majority of this client type. This low skill, playful drawing tool can serve to motivate clients to loosen up and engage in the process of drawing. As art therapist Tatjana said, “This (tool) would be an invitation for clients to use their body in the way (they) feel fairly safe.”
Other potential populations mentioned by therapists include those suffering from grief and loss, cancer, chemo patients, feeble-mindedness, AIDS, sexual abuse, child abuse, native clients, autistic children, children with attachment issues, teenagers, couples and families.

**Prospective Clients vs. Resistive Clients**

In addition to the previously mentioned potential populations, the experts generally categorized children and adolescents as most likely to respond quickly to this drawing tool. The kinaesthetic user interface should be very approachable to the people used to playing video games or familiar with electronic devices. The innovative technology and huge drawing canvas would draw adolescents’ attention and encourage them to explore the system. Further, the therapists suggested that there is great potential for adolescents to use this tool in a social context. For example, adolescents could explore issues by creating visual artwork to communicate and socialize with others at school.

The people who might resist this tool could include perfectionists. Instead of exploring the process of drawing, perfectionists might end up focusing on how to draw realistically or worrying how therapists would judge them from their body movement. Traditional artists are also likely to lose interest because the tool will not allow them to work on details or draw precise line work. Moreover, some seniors could resist using this tool because they are not being open to the technology. Finally, depression clients with low self-esteem might resist using this tool because they are afraid to draw with large movements.

**How Can Whole Body Movement Aid Art Therapist in Achieving Therapeutic Goals?**

In response to the question on the questionnaire, “What therapeutic goals is this drawing tool likely to achieve better than the drawing tools currently in use?” all interviewees choose “facilitate client’s ability to express through movement. Six of seven interviewees choose “increase creativity in therapy sessions”. The reason for the only interviewee’s not choosing the option is because she doubts if this kinaesthetic tool can increase creativity. The interviewee further clarifies it should be the creative expression to be increased rather than the creativity. Such consensus confirms the author’s hypothesis that whole body movement can help enhance a client’s ability to express creatively. When drawing in a sitting posture, clients tend to focus on their mind activities. While drawing with whole body movement, clients are able to fully experience 3D body movement and express thoughts through the rhythm of movement. Other
therapeutic goals the interviewees consider relevant are to reduce clients’ anxiety, increase their ability to reveal inner feelings and facilitate therapists’ categorizing clients’ emotions.

In the interview, Dr. Duanita pointed out that memory and pre-cognitive trauma could be stored in the cells of body because trauma is a body-mind experience. When people get hurt, the traumatized image is stored at the cellular level of the body. The advantage of using whole body movement is to aid therapists in accessing and healing trauma at the cellular level. She illustrated this tool can effectively help therapists gain access to patients’ pre-cognitive trauma and bring memories and feelings to the surface. Further, the integration of art and movement can stimulate the healing process.

What Design Parameters Can Aid Contemporary Art Therapists?

The researcher has summarized the main key points from the interviews as to why the therapists are certain this is an effective tool to meet their needs. Primarily, this drawing device provides a playful entry to encourage clients to connect to their creativity. Often adults’ body movements are more constrained than children’s because they are more self-conscious and care about people’s judgement. When using this kinaesthetic tool, the whole body movement is essential and inescapable if users are to create a final product. With motion-sensing stimulation and low skill operation, clients naturally loosen their body and let down their guard in the drawing process. The generative strokes provide clients with options to experience the poetic nature of drawing. The fun nature also shifts a client’s focus from making a final product to creating body movement. Given the setting is a virtual environment, clients do not need to worry about exhausting art materials. In addition, client can make as much of a mess as he/she likes because the projected image is impermanent.

The second key point is that this tool can aid art therapy practitioners in observing a user’s creative process and initiating meaningful communication for further diagnosis. The recorded drawing process allows a therapist and his/her client to review previous drawings and ask questions. Thus they can communicate verbally about the process of drawing and body’s actions.

The third key point is that the characteristics of this motion-sensing drawing system are highly controllable and flexible at the same time. By adding or removing design features, therapists can target specific therapeutic goals. For example, a therapist can set constraints on
the clients to experience body movement within a specific setting. He can ask his clients to draw a straight horizontal line with thin stroke across the screen with slow steady hand movement under the setting of large movement range. Alternatively, he can provide all the options and the freedom that entails for a client to achieve other therapeutic goals. For instance, providing clients full colour palette, various types of stroke and different ways to make commands could boost their sense of control and lift up their self-esteem. This approach could benefit the people suffering from grief or bereavement.

The final key point is that this drawing tool provides a safe environment for the people with touch issues. Not required to touch any substance, they can draw in a comfortable way. In addition, because it is touchless, this tool can be adapted for use in an isolated area in a hospital where clients are kept out of contact with contaminants such as germs and certain substances.

Discussion about Design Features and Matrix Chart

Based on findings of the questionnaires, most interviewees strongly agree with the following statements.

1. This tool can facilitate users’ expressing emotion through body movement.
2. This tool provides users more body movement than common drawing tools do.
3. This tool aids users in revealing their subconscious through body movement.
4. This tool helps art therapists observe users’ body movements and further investigate users’ emotions.

After the author presented the matrix of design features to the interviewees, all of the experts agreed on the way the author categorizes design features and believed that the matrix covers most of the features. Additional features suggested by the experts include the ability to share the same canvas over Internet. This feature would provide users the ability to draw together over a long distance. The second design features requested by the therapists is additional methods for both clients and therapists to control the interface and make commands. A few therapists also mentioned the need to use this drawing tool by couples, families and groups. The fourth design feature was suggested by Dr. Duanita. She would like to add chest under the body interaction section. She explained that she would use instructions such as “Create with your heart! Create with your guts!” to her clients with this feature. The advantage of
this feature is that users do not need to translate emotions through hand movements. Therefore, this feature shortens the distance between the user’s physical body and final product. The fifth feature mentioned by therapist is to provide a friendly interface for users to share their digital art on blogs or social networks. For the stroke parts in the matrix, therapists suggested to add brightness and hues for users to select and to also make strokes able to blend into each other which would be useful for clients to create transitions while painting. Last but not least, some therapists request creating a tangible product for clients because displaying the physical artwork can lead the clients to reflect on the meaning of the whole experience and evoke the memory by reviewing the visual image.

During the interviews, interviewees were most interested in the design features under the movement category because movement brings about feelings, memories and emotions to the drawing process. Experts remarked that with movement this system incorporates the process of art making with the final artwork. Moreover, the interviewees are pleased with the recoding feature as it helps emphasize the process of drawing. The collated data would aid therapists in understanding the process of drawing and further communicate with clients. The experts noted that in addition to using this motion-sensing device in a clinical setting, this drawing device can also be very useful as a teaching tool for supervision and consultation. For instructors and students the ability to review the process of drawing can help provide more insight than with regular art materials. In addition, by observing the various factors of stroke motion such as weight, direction, time and space, therapists can further recognize a user’s physical and emotional state.

**Weakness and Defects**

The major difference between traditional art materials and this kinaesthetic tool is that this tool lacks tactile feedback and physical contact, for body movements in lieu of hands serve as drawing tools. As a result, clients can not physically hold or move the tool in the drawing process. However, physical contact is an essential element for most therapists to achieve therapeutic goals. For example, punching the clay allows clients to releasing anger. The second issue is that the motion-tracking function could delay due to the kinaesthetic capacity of various computer models. Therapists also pointed out the intellectually challenged clients might have difficulty learning to use the tool. In addition, therapists find it hard to compare the device with
other tools because there is no similar drawing tool in the market. They also indicate users’ first-hand experience is required to validate the effectiveness of the tool.

**Evaluation on the Study Design**

The design of this semi structured interview not only aids researcher collecting relevant data but also keep the conversation toward an open ending. With the one-on-one interviews, the researcher is able to investigate the usage in detail. The demo video and questionnaire offer both the researcher and interviewees a quality discussion about this research. In the process of study, the researcher found some art therapists were struggling with certain questions when filling questionnaire. A therapist remarks that these questions are interrelated. Therefore it is difficult for her to answer. In addition, a therapist pointed out that sub-consciousness and emotions are abstract concepts, which cannot be quantified.

**Future Prototype Development**

The major future projects for this kinaesthetic tool are to make the device easy to install and user-friendly in order to appeal therapists to use this tool in their practices. In addition, a step-by-step operation manual or self-tutoring video should be created to quickly familiarize therapists and clients with the tool. All of the therapists indicate easy access is critical for clients to open themselves to this new media.

Moreover, while the system allows clients to move body freely in the space provided, it does not create boundaries for clients to push against. In art therapy, imposing constraints on clients is equally essential as giving clients freedom in order to achieve therapeutic goals. This comment lends a brand new perspective to the design of the device.

The researcher also considers integrating text, sound or music elements into the system for further experiment, which is bound to open a new horizon to the research on therapeutic digital tools.
5.6 Summary

In brief, this preliminary study shows the prototype has great potential to be applied to treating various client types. The system was evaluated by experts as expressive and creative as possible. Through the interviews the researcher investigated how whole body movements can aid therapist in achieving therapeutic goals and established the beginnings of common ground between interactive designers and art therapists. Potential clients and usages of prototype were identified by the therapists. In addition, advantages and defects of this prototype were discussed and weighed. The potential follow-up projects include modifying the device following art therapists’ critiques, simplifying installing process, creating users’ instruction manuals, adding sound elements to the function menu and holding workshops for practitioners and interns to familiarise them with this kinaesthetic drawing tool and discover further usage.
Chapter 6.

Conclusions and Future Work

The first finding of this research is that using whole body movement to draw can benefit a wide range of art therapy clients to improve their mental or physical condition. The interviewees identified a wide range of populations that can benefit from the tool including those with physical disabilities, ADHD, autism, eating disorders, anger issues, anxiety, depression, grief and loss and speech impairment. In addition, based on the data collected from expert interviews, all of the seven art therapists (with varied backgrounds and an average fourteen years of practice) would consider using this whole body kinaesthetic drawing tool in their therapy sessions. Most experts pointed out they would like to apply this tool with their specific field first. Based on above findings, applying whole body movement in the drawing process shows great promise to fulfill the needs of both art therapists and clients.

The rationale behind the kinaesthetic tool developed by the researcher is that most drawing tools are goal-oriented and the actions involved in using them are essentially pre-conditioned, limited and are more suited for the purpose which places product over process. However, most contemporary art therapists tend to emphasize the process of drawing rather than final works. Additionally, art therapy clients have an urgent need to resolve personal issues and overcome inner trauma. Hence, the need for a drawing tool focusing on the process and producing immediate results does exist. On the other hand, body movement, as human’s major medium of communication, serves the purpose of creating meanings, delivering messages and generating dialogues. Consequently, drawing movement should not be limited to the hand and wrist movement. Whole body movement should not be overlooked in art therapy sessions, but rather should be seriously considered as an effective medium for treatments and diagnosis.

The second finding of this research is that whole body movement can increase clients’ creative expression and further facilitate therapeutic procedures. In response to
the question, “What therapeutic goal is this tool likely to achieve better than other
drawing tools currently in use?” most of the experts indicated the device could facilitate
“Expressing through body movement and increasing creativity in the therapy session.”
This result shows that whole body movement can facilitate the creative process of art
making and artistic self-expression, which is fundamental to the effect of art therapy on
an individual’s physical, mental and emotional well-being. The art therapists’ responses
also echo the dance movement therapists’ assumption, “The creative process embodied
in the use of free association in movement is inherently therapeutic” (Stan-Jones, 1992).

While a client drawing with whole body movement, not only does the final art
product record the trajectory of body movement, but it also reveals the clients’ emotion,
feelings and memory in a visual form. What therapists and clients can gain from drawing
with whole body movement instead of the regular dance movement is that they can
construct meanings through observing colour, composition and texture. Further,
combining art and whole body movement can help enhance the self-healing ability.

Other benefits of the whole body movement mentioned in the expert interviews
included “movement bringing motivation, memory, and emotion” and “connecting mind
and body, accessing trauma at the cellular level”. The experts pointed out this motion-
sensing tool allows clients to reveal body movement beyond hand and wrist thereby
enhancing the possibility of revealing hidden emotions and memories. The experts’
viewpoint aligns with Kagin and Lusebrink’s Expressive Therapies Continuum (ETC)
framework, i.e. through whole body movement, clients are able to boost their
kinaesthetic level and further lift up their Perceptual/ Affective level, cognitive/ symbolic
level and creative level in the drawing process.

It is worth noting that this motion-sensing tool lacks tactile feedback and physical
contact with the artwork. It is fair to say between the kinaesthetic and sensory levels, this
tool leans toward the kinaesthetic. In addition, using gestures to draw in-air does not
allow users to control their line work as precisely as with traditional materials because
there is no surface to provide resistance. Without physical contact, it is more difficult for
users to be aware of when the line starts and ends in the drawing process. Moreover,
clients cannot obtain therapeutic effect through the sense of touch. On the plus side,
some experts pointed out, this imperfect characteristic can actually lead clients to loosen up and become more creative.

In the interviews, the experts also indicated that using body parts as a drawing tool helps reduce the time for clients to express themselves to produce a final product because they were free from the barriers of physical materials, especially when clients are asked to, for example, “draw with your heart!” by art therapists. Clients are able to move their chest (heart) to draw directly on the screen. Thus, they do not need to transfer the expression through their hands and arms. The author assumes that assigning different strokes to a user’s limbs, chest and head can help clients experience an increased level of body awareness. For example, using the chest to draw allows clients to experience the emotional levels in Halprin’s three levels of awareness and response theory (Halprin, 2008). When assigning strokes to different body parts continuously during the drawing process, the researcher assumes this design feature can aid clients in practicing looping and ascending through physical, emotion and mental levels.

The third finding is that the validated matrix of design features can be a valuable tool for art therapists to communicate with interactive designers and actively participate in the tool development. During the interviews, the experts mentioned the device could be more effective if possible extra features had been added to the prototype such as adding the feature for multi-users to make commands and draw over long distance. Nevertheless, all the experts approved the way the matrix is organized and agreed that the matrix covers most design features. Further, the experts were ready to use the matrix as a framework to specify combinations of settings for specific user scenarios. This result shows how the matrix can also be used by art therapists to customize the design features for their particular needs and clients’ issues.

According to the results from the expert interview, most of therapists found it hard to compare this prototype with other drawing tools because there is no similar drawing tool in the market. They also indicated users’ first-hand experiences are required in order to ensure the effectiveness and appropriateness of the device as a tool for treatment and further bridge the gap between interactive technology and art therapy. To achieve this,
experts suggested holding workshops for the art therapists to familiarize themselves with the medium and to further conduct clinical trials on the clients. Art therapists would then gather and analyze the outcome from such workshops to validate the combinations of setting for specific user scenarios. In addition, to avoid thesis bias, i.e. the seven respondents might have unanimously approved the effect of the tool simply because they were invited to participate in the demonstration, the researcher recommends inviting dance movement therapists to participate in future workshops. It is hoped the dance movement therapists’ input can help compare the pros and cons of various therapeutic methods. Moreover, art therapists can benefit from dance movement therapists’ critiques to design and develop innovative treatment procedures when applying this new medium in a clinical setting.

Based on the reflections aforementioned, the researcher believes the next task is mainly to make the motion-sensing drawing tool more user-friendly. The researcher built the final prototype aimed at collecting the therapists’ feedback. To apply this drawing tool in a clinical setting, the user interface and design features need to be refined and better integrated. In addition, there is a need to keep exploring new possible design features of the system. Thus, the author recommends future researchers use the matrix and ETC theory as a guide to discover and develop new features in order to cover the diverse aspects in each level of ETC. For instance, combining tangible objects with the device can make up for the deficiency of the tactile feedback at the sensory level of the device. Thus, the system can be made appropriate to provide art therapists with more options and to attain wider therapeutic goals.

The ultimate future goal of this research is to apply this tool in a clinical setting and to further collect data and feedback from both experts and clients. By comparing and contrasting these two viewpoints, the researcher can further validate the settings and fine-tune the prototype.

With regard to the contributions of the research detailed in this thesis, two are especially noteworthy. The thesis documents the exploration design process in a manner to enable other interactive designers to work with motion-sensing drawing tools. The kinaesthetic drawing prototype was created to update current technology and
explore the idea of integrating whole body movement into art therapy sessions. However, other uses beyond clinical settings were also mentioned by the experts. Their suggestions included using the prototype as a teaching tool for supervision and consultation in art therapy schools or as a research tool for therapists, and even using it as a social tool for adolescents to explore themes or topics related to emotion management at school.

The second contribution of this research is to facilitate the knowledge transfer between researchers and practitioners. By creating a matrix framework, researchers and art therapists can establish a common language to chart this new territory. The use of a motion-sensing drawing tool with potential populations is identified in the qualitative study. In future workshops, therapists can use these findings as a guideline for further validating the functions of the tool with their clients. For interactive designers who would like to explore design features for art therapy, this matrix can serve as a stepping stone for methodologies on how to design art tools in an art therapy context. Furthermore, this matrix can be a handy framework for interactive designers to evaluate and develop future systems. Some researchers may question the objectivity and impartiality of this qualitative approach due to the small sampling of interviewees and the semi-structural nature of the interview. However, art therapy practice is a human-centered discipline. Clients and therapists are facing personal issues and problems in life. Thus, collecting data through professional art therapists by semi-structure interviews appears to be the appropriate approach.

In conclusion, as a visual artist, this study provided a great opportunity for the researcher to review drawing from a different perspective. Instead of emphasizing applying technology to enhance a final art product, the researcher focused on how technology can be used to enhance the process of drawing to restore mental balance. The researcher has adopted this alternate focus to compensate the fact that the healing quality of drawing is often overlooked. Through the creative process, drawing can serve as a powerful therapeutic approach to aid individuals in solving the conflicts and problems of life. Thus, this study is in essence collaboration between art therapists and interactive designers to enrich expression and observation. It is hoped that this study will
prove to be a piece of the puzzle to aid future researchers in fulfilling the vision of using technology to mend and map the human mind.
References


Proceedings of the 2001 symposium on Interactive 3D graphics (pp. 85–93).


Appendices
Appendix A.

Interview Procedures

<table>
<thead>
<tr>
<th>No</th>
<th>Procedures</th>
<th>Duration</th>
<th>Content of activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>5 minutes</td>
<td>Researcher introduced interview procedures to interviewee. And further asked interviewee to sign the consent form.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstration</td>
<td>5 minutes</td>
<td>Researcher played a 5 minute demonstration video to interviewee to refresh features of the prototype.</td>
</tr>
<tr>
<td>3</td>
<td>Filling a questionnaire</td>
<td>10 minutes</td>
<td>Interviewee asked to fill out a simple questionnaire.</td>
</tr>
<tr>
<td>4</td>
<td>Interviewing</td>
<td>20 minutes</td>
<td>During the interview researcher introduced a feature matrix chart for discussion to find out what design features art therapy needs.</td>
</tr>
<tr>
<td>5</td>
<td>Interviewing</td>
<td>20 minutes</td>
<td>In this section the researcher asked the expert to imagine three user scenarios for this tool. And further identified the design features for specific user scenarios.</td>
</tr>
</tbody>
</table>
Appendix B.

Questionnaire

A Whole Body, Kinaesthetic Digital Drawing Tool for Art Therapy

This research intends to discover the possible design features and usages of a Motion-Sensing drawing tool. The study includes a questionnaire and a short individual interview. Your opinions stated below could be used as part of the research.

First Name: __________________________
Surname: ____________________________
Designation:____________________________(Ex. Ph.D. or Psy.D.)
Contact: E-mail :_____________________________________________
Telephone:__________________________________________

_____ How long have you been practicing art therapy professionally?
< 5 yrs 11-15 yrs
5-10 yrs >15 yrs

Where you have practiced? Private clinic or community or hospital?

For the next several questions, please choose three answers and place the answer from most related to least related.

Example:

A, D, B : What therapeutic goals is this drawing tool likely to achieve better than the drawing tools currently in use? (Answer that apply)

_____ What therapeutic goals is this drawing tool likely to achieve better than the drawing tools currently in use? (Answer that apply)

A. Reduce anxiety  E. Increase creativity in the therapy session
B. Increase self esteem  F. Decrease maladaptive coping skills and behaviours
C. Facility client’s ability to express through movement  G. Increase client’s ability to reveal inner feeling
D. Facility therapist ability to label clients emotion  H. Others (Please specify)
What populations would benefit most from this drawing tool? (Answer that apply)

People with
A. Emotional problems,  D. Physical disabilities,
B. Behavioural problems,  E. Learning disabilities,
C. Mental health problems,  F. Others ______________________

For the next several questions, please choose a number from 0-10 and write it next to the statement to indicate how much you agree or disagree with the statement.

0 1 2 3 4 5 6 7 8 9 10
Not at all Strongly agree

_____ This drawing tool provides users more body movement than common drawing tools.

_____ This drawing tool can facilitate users’ expressing emotion through body movement.

_____ This drawing tool can aid art therapist to reveal clients’ subconscious through body movement?

_____ This tool can help me observe users’ body movement and further categorize users’ emotion.

_____ I would consider using this tool in therapy sessions.
Yes
No _______________________(Please give specific reason)
Interview questions

How would you imagine using it in your practise? (Please specify the types of patients/clients, the specific clinical procedures/treatment or circumstances, etc.)
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Besides all the possible parameters in figure 1. (See next page). What extra design features you would like to equip this drawing tool with? (For example: Voice recognition)
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

What features are you most interested in? And why?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

What is missing from doc, how would you show it differently?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Have you detected any defects or weakness of this tool? What would you suggest to overcome them?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
In your opinion, who could be the most prospective clients seeking this tool? Who could be the clients resisting using this tool? (Please state the reasons)

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

Can you recall any cases where the treatment dealt with some features of this tool? (Client example: What’s their age, education/profession, gender, physical health, mental health...etc? These features include: touchless canvas, movement range, body interaction, brush types, brush behaviours …etc.)

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

Look to the future what would you suggest to this research?

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________
## Appendix C. Possible Design Features – Matrix Chart

<table>
<thead>
<tr>
<th>Movement</th>
<th>Body parts' range type</th>
<th>Visual effect</th>
<th>Stroke life period</th>
<th>Stroke types*</th>
<th>Stroke effects*</th>
<th>Colour palette</th>
<th>Recording saving modes*</th>
<th>Interaction</th>
<th>Therapist interaction modes</th>
<th>Methods for commands* (menu, clear)</th>
<th>Embodiment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large (width 9ft.)</td>
<td></td>
<td>Forever</td>
<td>Traditional stroke tip</td>
<td>Thick/long</td>
<td>Full colour picker</td>
<td>Process of drawing</td>
<td>Paint alone</td>
<td>Voice</td>
<td>1. Fully-Embodied</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium (width 6ft.)</td>
<td></td>
<td></td>
<td>Normal stroke</td>
<td>Thin/short</td>
<td>Fixed palette of colours (Primaries)</td>
<td>Conversing white while painting</td>
<td>Paint with therapist</td>
<td>Clapping</td>
<td>2. Semi-Embodied</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tight (width 3ft.)</td>
<td></td>
<td></td>
<td>Body paint</td>
<td>Auto colour system</td>
<td>Save in steps</td>
<td>Save and label</td>
<td>Standing distance (touchless canvas)</td>
<td></td>
<td>3. Not-Embodied</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One leg</td>
<td></td>
<td></td>
<td>Head</td>
<td>Particle system</td>
<td>Save</td>
<td>Guided steps (background then foreground layer)</td>
<td>Z movement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two legs</td>
<td></td>
<td></td>
<td>Head</td>
<td>Paint ball</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D.

Statistic of Questionnaire

1. What therapeutic goals is this drawing tool likely to achieve better than the drawing tools currently in use? (Answer all that apply)

   - A. Reduce anxiety
   - B. Increase self ...
   - C. Facility clien...
   - D. Facility thera...
   - E. Increase creat...
   - F. Decrease malad...
   - G. Increase clien...
   - Other

2. What populations would benefit most from this drawing tool? (Answer all that apply) People with

   - A. Emotional prob...
   - B. Behavioural pr...
   - C. Mental health ...
   - D. Physical disab...
   - E. Learning disab...
   - Other
3. This drawing tool provides users more body movement than common drawing tools do.

4. This drawing tool can facilitate users’ expressing emotion through body movement.

5. This drawing tool can aid users to reveal their subconscious through body movement.
6. This tool can help me observe users' body movements and further categorize users' emotions.

7. I would consider using this tool in therapy sessions.
## Appendix E.
### Background of Interviewees

<table>
<thead>
<tr>
<th><strong>Carol (kali) Dukoski</strong> (M.A)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field of profession.</strong></td>
<td>Autistic Children</td>
</tr>
<tr>
<td><strong>Duration of practice</strong></td>
<td>15 years +</td>
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<tr>
<td><strong>Current position</strong></td>
<td>Instructor of Vancouver Art Therapy Institute</td>
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<tr>
<td><strong>The places practiced</strong></td>
<td>Agencies and private practice.</td>
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<tr>
<th><strong>Dr. Duanita G. Eleniak</strong> (MSW RSW ATR RCAT BCATR PHD)</th>
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<tr>
<td><strong>Field of profession.</strong></td>
<td>Trauma</td>
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<tr>
<td><strong>Duration of practice</strong></td>
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<td><strong>Current position</strong></td>
<td>Adjunct Instructor of Adler School of Professional Psychology</td>
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<td><strong>The places practiced</strong></td>
<td>Private clinic, community and hospital.</td>
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<tr>
<th><strong>Tatjana Jansen</strong> (D.V.A.T.I, MC:AT)</th>
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<tr>
<td><strong>Field of profession.</strong></td>
<td>Children and Adolescents</td>
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<tr>
<td><strong>Duration of practice</strong></td>
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<td><strong>Current position</strong></td>
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<td><strong>The places practiced</strong></td>
<td>Community agencies, hospital, private practice.</td>
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<tr>
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<td>Field of profession</td>
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<td><strong>Gretchen Ladd</strong> (B.A., B.F.A, D.V.A.T.I)</td>
<td>Cancer Patients</td>
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<tr>
<td><strong>Mehdi Naimi</strong> (M.A, RCAT, RCC)</td>
<td>Children and Adult</td>
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<tr>
<td><strong>Laura Worrall</strong> (D.V.A.T.I, MC:AT, RCC, RCAT)</td>
<td>ADHD Children</td>
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