



The Effect of Clay Manipulation on Upper Extremity Dysfunction

Katie Whitfield, OTD; Dr. Chris Eidson, PhD, OTR/L, FAOTA

Department of Occupational Therapy | University of Alabama at Birmingham

Kris Milliron, OTR/L, CHT | Encore Rehabilitation

Valerie Hanks, MAAT, ATR | University of Alabama at Birmingham Arts in Medicine

Introduction

- Upper extremity (UE) dysfunction encompasses a wide range of diagnoses and can include symptoms such as reduced grip strength, pinch strength, dexterity, and impact activities of daily living (ADLs) and instrumental activities of daily living (IADLs).
- Therapeutic putty has been shown to improve grip and pinch strength in Parkinson's disease (PD)¹ and rheumatoid arthritis².
- Clay is a creative medium with similar properties to therapeutic putty. Creating a pottery piece is a goal-directed activity that can improve mood, decrease anxiety, and promote creativity³.
- Studies have found clay manipulation to decrease tremors and improve dexterity among clients with PD⁴, but there is a gap in the research addressing the effect of pottery on musculoskeletal conditions of the UE.
- The purpose of this research is to examine the effects of a 5-week pottery program on grip strength, pinch strength, dexterity, self-expression, and emotional regulation among adults with hand dysfunction.

Methods

- Four participants with a mean age of 71.25 enrolled in the study and participated in a one-hour pottery program once a week at Encore Rehabilitation in Hoover, Alabama. 3 participants attended 4 sessions, while 1 participant attended 3 sessions.
- Participants completed pre-test, midway, and post-test data collection, which included:
 - Grip strength using a hand dynamometer
 - Pinch strength using a pinch gauge (2-point, 3 jaw chuck, key)
 - Hand dexterity using the nine-hole peg test
 - Modified Self-Expression and Emotion Regulation in Art Therapy Scale (SERATS) (Pre-test and post-test only)
- Pottery sessions consisted of 5 minutes of leaded deep breathing followed by participants manipulating air-dry clay to create the following over 5 weeks:
 - Ring dish
 - Pinch pot
 - Soap dish
 - Coil pot
 - Flowers
- Participants were also given a home program consisting of exercises to complete with provided clay twice a day to target grip and pinch strength.



Results

Table 2: Pretest and Posttest Frequency Responses for SERATS

| Item | Frequency of responses (Pretest) | Frequency of responses (Posttest) |
|--|---|---|
| I get in touch with my feelings through the process of making art | (Almost) always true (n=0): 0% Often true (n=0): 0% Sometimes true (n=2): 50% Seldom true (n=2): 50% Never true (n=0): 0% | (Almost) always true (n=2): 50% Often true (n=0): 0% Sometimes true (n=2): 50% Seldom true (n=0): 0% Never true (n=0): 0% |
| I am able to depict my feelings through art | (Almost) always true (n=0): 0% Often true (n=0): 0% Sometimes true (n=3): 75% Seldom true (n=1): 25% Never true (n=0): 0% | (Almost) always true (n=1): 25% Often true (n=0): 0% Sometimes true (n=3): 75% Seldom true (n=0): 0% Never true (n=0): 0% |
| Through the process of making art I am able to discover what is at play within me | (Almost) always true (n=0): 0% Often true (n=0): 0% Sometimes true (n=3): 75% Seldom true (n=1): 25% Never true (n=0): 0% | (Almost) always true (n=0): 0% Often true (n=2): 50% Sometimes true (n=2): 50% Seldom true (n=0): 0% Never true (n=0): 0% |
| I am able to express my feelings through the process of making art | (Almost) always true (n=0): 0% Often true (n=2): 50% Sometimes true (n=1): 25% Seldom true (n=1): 25% Never true (n=1): 25% | (Almost) always true (n=1): 25% Often true (n=2): 50% Sometimes true (n=1): 25% Seldom true (n=0): 0% Never true (n=0): 0% |
| I am able to make things fall into place in the art | (Almost) always true (n=0): 0% Often true (n=0): 0% Sometimes true (n=3): 75% Seldom true (n=1): 25% Never true (n=0): 0% | (Almost) always true (n=0): 0% Often true (n=0): 0% Sometimes true (n=2): 50% Seldom true (n=2): 50% Never true (n=0): 0% |
| Making art is a kind of outlet for me | (Almost) always true (n=0): 0% Often true (n=2): 25% Sometimes true (n=1): 25% Seldom true (n=1): 25% Never true (n=1): 25% | (Almost) always true (n=0): 0% Often true (n=2): 50% Sometimes true (n=2): 50% Seldom true (n=0): 0% Never true (n=0): 0% |
| A piece of art I have created can help me hold on to a particular feeling | (Almost) always true (n=0): 0% Often true (n=0): 0% Sometimes true (n=1): 25% Seldom true (n=1): 25% Never true (n=1): 25% | (Almost) always true (n=0): 0% Often true (n=1): 25% Sometimes true (n=2): 50% Seldom true (n=0): 0% Never true (n=1): 25% |
| I gain greater insight into my psyche through making art | (Almost) always true (n=0): 0% Often true (n=0): 0% Sometimes true (n=3): 75% Seldom true (n=1): 25% Never true (n=0): 0% | (Almost) always true (n=0): 0% Often true (n=2): 50% Sometimes true (n=2): 50% Seldom true (n=0): 0% Never true (n=0): 0% |
| I apply the new behavior that I've been experimenting with in therapy outside of the therapy setting | N/A | (Almost) always true (n=0): 0% Often true (n=1): 25% Sometimes true (n=1): 25% Seldom true (n=1): 25% Never true (n=1): 25% |

Table 4: Pretest and Posttest Grip and Pinch Strength

| Participant | Hand | Strength Measurement | Pretest | | Midway (lbs.) | Posttest (lbs.) | Difference between pretest and posttest (lbs.) | Percent Change |
|-------------|-----------------|----------------------|----------------|---------------|---------------|-----------------|--|----------------|
| | | | Pretest (lbs.) | Midway (lbs.) | | | | |
| 1 | Left (affected) | Grip Strength | 43.67 | 42.67 | 31.33 | -12.33 | -28.24% | |
| | | Key Pinch | 9 | 11.33 | 9 | 0 | 0% | |
| | | 2-Point Pinch | 4.67 | 9.67 | 10 | 5.33 | 114.29% | |
| | Right | 3-Jaw Chuck | 4.67 | 5 | 10.33 | 5.67 | 121.43% | |
| | | Grip Strength | 51 | 55.67 | 62 | 11 | 21.57% | |
| | | Key Pinch | 9.67 | 12 | 14 | 4.33 | 44.83% | |
| 2 | Left (affected) | 2-Point Pinch | 9.33 | 9 | 9 | -0.33 | -3.57% | |
| | | 3-Jaw Chuck | 7 | 10.33 | 9.33 | 2.33 | 33.33% | |
| | | Grip Strength | 34.33 | 42.33 | 45.33 | 11 | 32.04% | |
| | Right | Key Pinch | 8.33 | 9.33 | 8.33 | 0 | 0% | |
| | | 2-Point Pinch | 7.33 | 6.67 | 5.67 | -1.67 | -22.73% | |
| | | 3-Jaw Chuck | 8.33 | 10 | 10 | 1.67 | 20% | |
| 3 | Left (affected) | Grip Strength | 32.67 | 42.33 | 45.33 | 11 | 32.04% | |
| | | Key Pinch | 8.33 | 9.33 | 8.33 | 0 | 0% | |
| | | 2-Point Pinch | 7.33 | 6.67 | 5.67 | -1.67 | -22.73% | |
| | Right | 3-Jaw Chuck | 8.33 | 10 | 10 | 1.67 | 20% | |
| | | Grip Strength | 32.67 | 29.67 | 31 | -1.67 | -5.1% | |
| | | Key Pinch | 10 | 9.67 | 10 | 0 | 0% | |
| 4 | Left | 2-Point Pinch | 7.33 | 6 | 5.33 | -2 | -27.27% | |
| | | 3-Jaw Chuck | 9.33 | 7.33 | 8.33 | -1 | -10.71% | |
| | | Grip Strength | 32.67 | 29.67 | 31 | -1.67 | -5.1% | |
| | Right | Key Pinch | 10 | 9.67 | 10 | 0 | 0% | |
| | | 2-Point Pinch | 7.33 | 6 | 5.33 | -2 | -27.27% | |
| | | 3-Jaw Chuck | 9.33 | 7.33 | 8.33 | -1 | -10.71% | |

Table 3: Pretest and Posttest Performance of Nine-Hole Peg Test

| Participant | Hand | Pretest (seconds) | Midway (seconds) | Posttest (seconds) | Difference between pretest and posttest (seconds) | Percent Change |
|-------------|------------------|-------------------|------------------|--------------------|---|----------------|
| 1 | Left (affected) | 30.04 | 29.93 | 23.87 | -6.17 | -20.54% |
| | Right | 29.68 | 24.49 | 21.3 | -8.38 | -28.23% |
| 2 | Left (affected) | 24.91 | 23.44 | 22.59 | -2.32 | -9.31% |
| | Right (affected) | N/A | N/A | N/A | N/A | N/A |
| 3 | Left (affected) | 31.48 | 33.84 | 23.77 | -7.71 | -24.49% |
| | Right | 20.82 | 24.81 | 19.76 | -1.06 | -5.09% |
| | Left | 42.77 | 39.68 | 33.18 | -9.59 | -22.42% |
| | Right | 30.70 | 30.89 | 27.17 | -3.53 | -11.5% |



Discussion

- All participants improved in hand dexterity posttest.
- Participants reported more positive responses to self-expression and emotion regulation after engaging in the pottery program.
- 50% of participants experienced overall improvements in grip strength, with 50% experiencing an improvement in one hand and a decrease in grip strength in the other hand.
- Most participants either improved in lateral pinch strength or displayed no change.
- Participants experienced varying results in two-pin strength including improvements, no change, and decreases in strength following the program.
- 50% of participants experienced an overall improvement in three-pin strength.

Limitations:

- Small sample size and inconsistent participation in the group
- Varying hand diagnoses
- No participants were compliant with the home program

Conclusion

Implications:

- Current research supports the use of creative art therapies to improve mental health and wellbeing, though pottery can have an additional use in improving hand dexterity for people with various musculoskeletal conditions and osteoarthritis per the results of this study.
- Pottery also involves cognitive functions such as problem solving, emotion regulation, attention, memory, and impulse control, which leads it to be a helpful OT intervention targeting multiple deficits simultaneously.

Future research:

- Examine the relationship between the properties of clay and therapeutic putty to determine if clay could be used as a goal-directed alternative to putty for hand strengthening.
- Explore the effect of a similar pottery program on specific diagnoses to better understand the program's efficacy and guide clinical decision-making for practitioners.

References

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CONTACT INFO: Katie Whitfield: ktwhit@uab.edu