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Outcomes of a Creative Ability–Based Intervention: Advancing Independence in Learners With Severe Intellectual Disability

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ABSTRACT

Background: When supporting learners with severe intellectual disabilities, teaching methods needs to be adapted. Vona du Toit Model of Creative Ability (VdTMoCA) aims to enhance participation and facilitate adaptive responses through targeted intervention principles. This study aimed to develop and evaluate the impact of an intervention programme for learners with severe intellectual disability based on the VdTMoCA to improve independence in an Instrumental Activity of Daily Living (IADL), namely doing a laundry activity.

Method: A multiple case study with a literal replication design, including six subjects with severe intellectual disability, was used. The intervention consisted of a 1-week baseline assessment and four intervention sessions. To identify changes, levels of prompting and the time taken to initiate each step were measured.

Results: This study showed that a meticulously designed intervention programme based on the VdTMoCA principles rendered positive outcomes. Activity analysis and adaptation of the steps in a laundry activity, according to the principles of therapeutic relationship, presentation and structuring, contributed to this success.

1 | Introduction

Independence is recognised as one of the most important goals for people with intellectual disabilities (United Nations 2006). Intellectual disability, as defined by the DSM-5, is 'a disorder that results in intellectual and adaptive functioning deficits in conceptual, social, and practical domains' (Goldstein and DeVries 2017, 21). The diagnosis is based on the severity of the condition and its influence on everyday functioning. The DSM-5 states that limited functioning in daily activities and independent living tasks is one of the diagnostic criteria for intellectual disability (American Psychiatric Association 2013). Sever intellectual disability is characterized by high support needs in all domains of life and the need for long-term teaching to acquire skills (Goldstein and DeVries 2017). This results in a high burden of care for caregivers of individuals with severe intellectual disabilities. By increasing the level of independence in daily activities and lowering the amount of support needed, the well-being of both people with severe intellectual disabilities and their caregivers can be improved. This is supported by a study that critically reviewed Canada's integrated transition policy for learners with intellectual disabilities (McKay 2019).

The decreased burden of care on caregivers when learners with severe intellectual disabilities increase their level of independence is directly related to the proposed linear relationship

between independence and the amount of support needed (Aldridge 2010). Aldridge (2010) explained that independence is a continuum and that we cannot simply classify someone as dependent or independent. Therefore, by aiming to decrease the level of assistance needed to complete a task, therapy aims to increase independence in learners with severe intellectual disabilities. However, the DSM-5 criteria indicate that learners with severe intellectual disability will always need assistance to perform activities of daily living (ADL).

Learners with severe intellectual disabilities in a South African context are unlikely to transition successfully into employment upon leaving school at the age of 18 (Ellman, Sonday, and Buchanan 2020; Engelbrecht, Shaw, and Van Niekerk 2017). The goals for these school leavers are community integration and optimal independence in IADLs (McKay 2019; Rens and Louw 2021). Therefore, the schooling system should aim to equip learners with severe intellectual disability to achieve these goals.

It is widely known recognised that adaptive teaching methods are necessary for learners with severe intellectual disabilities to effectively retain information to learn new skills (Bowman 2012; Department of Education, 2001, 2002, 2010; Downing 2010; Jennings and Lehnerz 2018; Liberman 1998; Reid and Lienemann 2006). Occupational therapists (OTs) often form part of the multidisciplinary team at schools for learners with severe intellectual disability and aim to enable integration and participation in the home, school, workplace and community (American Occupational Therapy Association 2014; Ellman, Sonday, and Buchanan 2020; Nel, van der Westhuyzen, and Uys 2007). Studies, however, show that OTs have limited knowledge of how to assist learners with severe intellectual disability and their caregivers with strategies to improve independence upon leaving the formal schooling environment (Abbott and Provident 2016; Ellman, Sonday, and Buchanan 2020; Engelbrecht, Shaw, and Van Niekerk 2017).

The Vona du Toit Model of Creative Ability (VdTMoCA), used in OT, is one of the models that can be used to improve participation in activities and facilitate adaptive responses to positively influence independence in daily living tasks (du Toit, 2009; van der Reyden et al. 2019). The VdTMoCA is a developmental model that considers internal motivation and the quality of actions to determine an individual's level of creative ability. The VdTMoCA suggests that each individual has a sphere in which they function optimally and feel safe and comfortable, known as their creative ability (du Toit, 2009; van der Reyden et al. 2019). Within the context of the VdTMoCA, creativity is not viewed artistically but refers to a person's ability to respond to life's demands in a new way. This response produces a tangible or non-tangible (knowledge) output (du Toit 2009).

The VdTMoCA examines an individual's creative ability and the quality of their actions to indicate the level of development achieved. These levels of development are divided into nine categories, considering both the individual's level of action and motivation (du Toit, 2009).

The levels of creative ability and their corresponding action and volition indicate the level of development achieved. The model focuses on getting learners with different levels of cognition and physical functioning to participate to their full ability (van der Reyden et al. 2019). In this study, learners with severe intellectual disability functioned on the second level of creative ability, known as self-differentiation. They performed destructive and incidentally constructive actions. The destructive actions, such as throwing, pulling and tearing, were without malicious intent but were rather a discovery of how they can interact with materials and the environment around them. Examples of incidentally constructive actions included reaching out and holding or rubbing objects. They were not able to independently explore materials and objects without optimal environmental support and stimulation. The first four levels of creative ability are mostly seen in learners with severe intellectual disability. The levels of creative ability are listed in Table 1.

VdTMoCA is a developmental model that provides clear treatment principles that can be used for all ages to ensure optimal

TABLE 1 | Levels of creative ability.

Level	Internal motivation/volition	Actions
Tone	To maintain existence	Pre-destructive—purposeless and undirected movements
Self-differentiation	Egocentric and to differentiate self from others	Incidentally constructive or destructive
Self-presentation	To present self, though unsure	Explorative
Passive participation	Directed to attainment of skill, but hesitant to initiate action	Product-centred, starting to be aware of norm compliance
Higher levels of functioning not commonly seen in severe intellectual diablity		
Imitative Participation		
Active Participation		
Competitive Participation		
Contribution		
Competitive contribution		

participation, learning and subsequent independence (du Toit, 2009; van der Reyden et al. 2019). Although the VdTMoCA principles are widely used in mental health interventions (Crouch and Allers 2014), more evidence is needed to determine whether they can decrease the level of prompting needed for learners with severe intellectual disability to complete an IADL activity, thereby increasing their independence. A study by van de Vyver and Willemse (2006) used the levels of creative ability to assist with the screening of individuals with severe intellectual disability, highlighting the need for further research in using the VdTMoCA with this population.

To determine the effectiveness of using the VdTMoCA principles in increasing independence in learners with severe intellectual disability, a laundry activity, specifically the washing of socks, was utilised to develop an intervention programme and data collection tool (see Objective 1 in Figure 1). Laundry, specifically the washing of socks, was chosen to ensure that the activity could be replicated in a real-life setting and provide the opportunity for destructive actions, as stipulated in the VdTMoCA treatment principles for the self-differentiation level of creative ability, while still promoting independence IADL activities, as determined by the criteria for leaving school.

The Self-Regulated Strategy Development (SRSD) model, as described by Reid and Lienemann (2006), provides a systematic approach to developing specific intervention programme. The model provides evidence-based steps as described in Table 2 and uses strategies such as visual supports, task sequencing and personalised prompts tailored to individual's needs and abilities to facilitate independence and success in various daily activities. The SRSD model is based on strategy instruction, considers learners' motivation, academic abilities and cognitive functioning, and is widely used for learners with severe intellectual disability (Graham and Harris 2003).

Least to most prompting (Fentress and Lerman 2012) and the time taken to initiate each step of the activity were used to

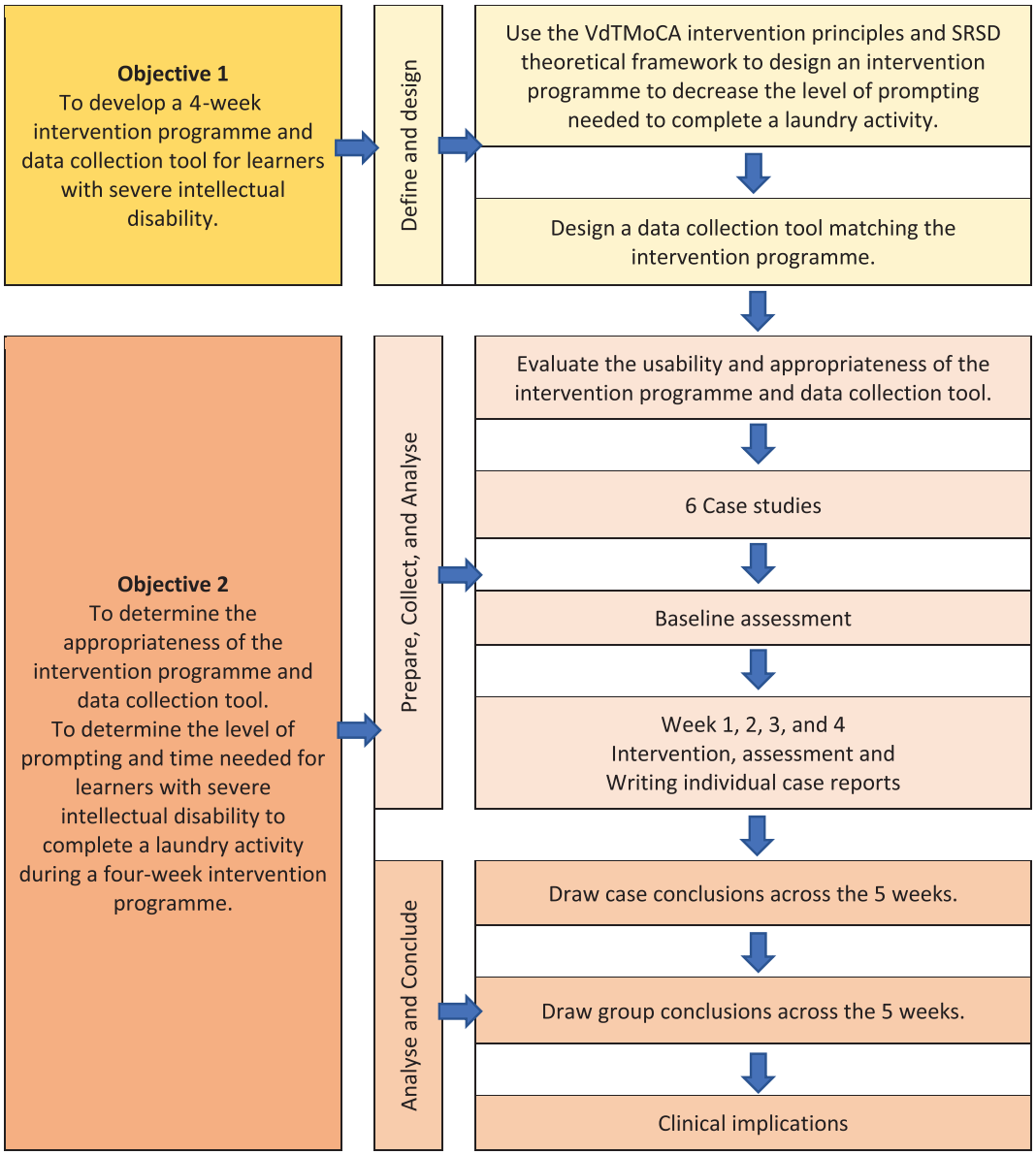

FIGURE 1 | The multiple case study literal replication design as adapted from Yin (2019).

TABLE 2 | Stages of the SRSD model and their application for the study.

SRSD developmental steps (Reid and Lienemann 2006)	Application in developing laundry activity intervention programme
Developing and activating Background knowledge	Step-by-step activity analysis (American Occupational Therapy Association 2014; Thomas 2015) Ability: Level of creative ability according to VdTMoCA (du Toit 2009; van der Reyden et al. 2019)
Introducing the strategy	Adapt tasks according to VdTMoCA principles (du Toit 2009; van der Reyden et al. 2019) Activity requirements Therapeutic relationship (handling) Presentation Structuring Refer to Table 3.
Modelling the strategy	Time to initiate the step of the activity Activity completion
Memorising the strategy	Repetition (du Toit 2009; van der Reyden et al. 2019)
Supporting the strategy	Least-to-most prompting (Fentress and Lerman 2012) Verbal Gesture Verbal and gesture Modelling Physical assistance Frequent measuring
Independent performance	Decreased prompting and time needed to complete the activity and increased independence The outcome of the intervention programme

TABLE 3 | Excerpt of steps of the activity according to principles and level of prompting.

Step 8		Pick up washing powder	Prompting guidelines
VdTMoCA principles	Therapeutic relationship principles	Acknowledge reaching or looking at the washing powder Say 'Good, you picked up the washing powder'	6. No prompt given 5. Say 'pick up the washing powder' 4. Point to the washing powder 3. Point to the washing powder while saying 'Pick up the washing powder' 2. Mimic picking up the washing powder while saying 'Pick up the washing powder' 1. Provide hand-over-hand assistance to pick up the washing powder while saying 'Pick up the washing powder' 0. Not responding to any prompt
	Presentation principles	Name the washing powder Comment on the weight of the washing powder Provide verbal prompts in prompting guidelines clearly and only using the words stated That the learner engages is more important than how he/she engages	
	Structuring principles	Present the washing powder during this step	

measure the level of independence of learners with severe intellectual disabilities' during an intervention.

After developing the 4-week intervention programme and data collection tool, the study aimed to provide evidence that the level of prompting needed by learners with severe intellectual disability to complete a laundry activity will decrease after implementing a 4-week intervention programme based on VdTMoCA.

1.1 | Hypothesis

In this current study, we tested the null hypothesis that the level of prompting and the time needed for learners with severe intellectual disability to complete a laundry activity would not decrease, and that their level of independence would not increase after implementing a 4-week intervention programme based on VdTMoCA.

2 | Methods

A multiple case study with a literal replication study design was used, as described by Yin (2019). No set number of cases was needed for a multiple case study with a literal replication design. Rather, it relied on the judgement and discretion of the researcher, with data saturation as the aim (Yin 2019). Six cases were included and literally replicated by providing the exact same intervention over 4 weeks. Literal replication strengthens the findings as it supports the assumption that the intervention led to a change in behaviour and not other external factors (Yin 2019). The study design is presented in Figure 1.

2.1 | Development of the Intervention Programme

The VdTMoCA provided the main theoretical background for the study.

The treatment principles for self-differentiation set out in the VdTMoCA were combined with the stages of strategy development as set out in the SRSD (Reid and Lienemann 2006) to follow a literal replication of each intervention session. The stages of development and how they were implemented are shown in Table 2.

The participants' level of creative ability and the corresponding principles guided the activity choice, namely washing of socks. This activity aligns with the OT goal of achieving independence in daily living while still allowing for destructive actions while performing a constructive task. The VdTMoCA principles ensured that the developed intervention programme was on a level that is achievable to learners with severe intellectual disability. As described by Thomas (2015), the researcher conducted an activity analysis that identified 52 steps involved in the laundry activity. Each step was then adapted and described in detail according to the VdTMoCA treatment principles and levels of prompting. Least-to-most prompting cues were defined for each step of the activity, providing a concrete data collection measure. The least-to-most prompting also provided learners with severe intellectual disability the opportunity to complete the activity even if they did not have the necessary skills. By defining each step and providing prompting if a learner could not complete the step, the activity was adapted to be achievable to the learners on a Self-differentiation level of creative ability. Although the theory states that the therapist should allow one to two steps at a time, introducing only one step at a time facilitates engagement and systematic learning in developing children. It also ensured that activity completion was achieved, which is one of the activity requirements for the self-differentiation level of creative ability. Prompting started with a verbal prompt, followed by a gesture and then a verbal prompt and gesture combined. After that, the step was modelled, and finally, physical assistance was given to complete the step. After 5 s of no action, the next prompt was introduced for each step of the activity. Scores ranged from 6 to 0, with 6 indicating no prompting needed and 0 indicating no response to the highest level of prompt, namely physical assistance. Literal replication of the intervention was provided throughout all sessions, which increased the study's rigour, reliability and validity (Brink, van der Walt, and van Rensburg 2018).

Some of the VdTMoCA principles were generic for each step of the activity, for example, the therapeutic relationship with learners included unconditional acceptance, a positive approach and verbally identifying people in the immediate environment. Generic presentation principles include using objects for their correct and usual purpose and repeating activities to reinforce the concept. Most structuring principles were generic for the activity. They included principles, such as treating in an environment that allows for destructive actions and controlling external stimuli to facilitate attention and concentration. Examples of how the steps of the activity were specifically adapted according to the principles and the detailed prompting guidelines are shown in Table 3.

2.2 | Developing the Data Collection Tool

Following the development of the intervention programme, as shown in Table 2, a supporting data collection tool was developed. This tool was designed to record data during structured observations of learners with severe intellectual disability, specifically to record the level of prompting needed for each step and the time to initiate each step. Four OTs with experience in the VdTMoCA and learners with severe intellectual disability evaluated the data collection tool and intervention programme to ensure that it was suitable to assess and treat the target population and determine the ease of use. The feedback from the OTs concluded that the content was suitable for learners with severe intellectual disability, and they made suggestions to improve ease of use. This assisted to make the tool easy to use. An excerpt of the final data collection tool is presented in Table 4.

2.3 | Study Population

Participants were included based on a set of inclusion criteria including diagnosed with severe intellectual disability, currently in their last year of formal schooling in a special needs educational setting, following the same school timetable, able to communicate in English, functioning on a self-differentiation level of creative ability as per the Creative Participation Assessment (van der Reyden et al. 2019), functioning on a Gross Motor Function Classification System and Manual Ability Classification System Level 2 or higher and in a low to medium socioeconomic group. Learners who were unable to self-mobilise were excluded from the study because the data collection tool did not allow them to ask to be moved to where they needed to perform the next step.

All learners who met the criteria were included in the study. Consent was obtained from the legal guardians of the participants as well as from the participants themselves, using an adapted consent form that used pictures to explain how the study would be conducted.

2.4 | Data Collection

The Ethics Committee of the Faculty of Health Sciences, University of Pretoria (Reference Number 888/2020) granted ethical approval.

TABLE 4 | Excerpt of data collection tool.

Steps of the activity	Levels of prompting							Time to initiate action (s)	Time interval	Total score: Prompting + time interval (out of 9)
	No prompting	Verbal prompt	Gesture	Gesture with verbal prompt	Modelling with verbal prompt	Physical assistance with verbal prompt	Not responding to any prompts		3 = 0–1 s 2 = 2–3 s 1 = 4–5 s 0 = > 5 s	
	6	5	4	3	2	1	0			
1. Pick up the bucket to wash the socks										

Before data collection, consent was obtained from all participants' legal caregivers. Participants also provided assent using pictures and the language they knew. Data were kept anonymous by providing each participant with a number and filling in sessional information accordingly.

The researcher completed the data collection tool for each participant on five occasions: one baseline session and four intervention sessions. The baseline assessment was performed by observing the learners doing the task without any intervention or prompting except for the initial instruction of 'I want you to wash these socks' provided. The baseline was assessed on how many steps the learner could complete independently and how much time it took to complete each of those steps.

The intervention session was analysed to determine the level of prompting needed, the time it took to initiate steps and the overall level of independence. For each step, the next prompt was introduced after 5 s of no action. The level of prompting, together with the time that it took the learner to show action, was noted to signify the overall level of independence in the laundry activity for each session.

Bias was accounted for by having the same therapist implement the intervention programme and adhering to the rigorously designed intervention programme. Furthermore, 20% of the sessions were rated by an independent OT using the same data collection tool. Results from the researcher and the external rater were compared and showed significant agreement, with p values < 0.0001 in the prompting, time and overall scores. This established external rater reliability.

2.5 | Statistical Analysis

The Wilcoxon signed-rank test was used to test for differences in the level of prompting and time needed for learners with severe intellectual disability to complete a laundry activity. All tests were performed at a 5% level of significance.

3 | Results

3.1 | Demographics of the Sample

Two female and four male learners with severe intellectual disability, aged 18 years old, functioning on a self-differentiation level of creative ability, were included.

3.2 | Level of Prompting

The null hypothesis was rejected as the level of prompting needed for learners with severe intellectual disability to complete a laundry activity decreased after implementing a 4-week intervention programme based on VdTMoCA. The level of prompting required for each learner per session is presented in Table 5. The mean of prompting was calculated across the 52 steps. At baseline assessment, the means ranged from 0 to 3.58. During the first intervention, the means ranged between

TABLE 5 | Means of prompt and time for each learner and group as a whole across all sessions.

	Learner 1 ($N=52$)	Learner 2 ($N=52$)	Learner 3 ($N=52$)	Learner 4 ($N=52$)	Learner 5 ($N=52$)	Learner 6 ($N=52$)	Group as a whole ($N=312$)
Baseline	0.00 ± 0.00	2.77 ± 3.02	3.58 ± 2.97	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	1.06 ± 2.29
plus/minus SD Prompt	0.00 ± 0.00	2.77 ± 3.02	3.58 ± 2.97	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	1.06 ± 2.29
plus/minus SD Time	0.00 ± 0.00	1.29 ± 1.45	1.63 ± 1.46	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.49 ± 1.08
plus/minus SD Total score	0.00 ± 0.00	4.06 ± 4.44	5.21 ± 4.36	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	1.54 ± 3.35
Intervention Session 1							
plus/minus SD Prompt	5.00 ± 1.40	5.79 ± 0.57	5.73 ± 0.87	4.71 ± 1.85	5.58 ± 0.54	5.44 ± 0.75	5.38 ± 1.16
plus/minus SD Time	2.73 ± 0.56	2.98 ± 0.14	2.90 ± 0.30	2.73 ± 0.66	2.85 ± 0.36	2.87 ± 0.40	2.84 ± 0.44
plus/minus SD Total score	7.73 ± 1.60	8.77 ± 0.67	8.63 ± 0.97	7.44 ± 2.25	8.42 ± 0.72	8.31 ± 1.00	8.22 ± 1.40
Intervention Session 2							
plus/minus SD Prompt	5.46 ± 1.06	5.92 ± 0.27	5.96 ± 0.19	4.98 ± 1.61	5.75 ± 0.76	5.71 ± 0.57	5.63 ± 0.94
plus/minus SD Time	2.83 ± 0.47	2.92 ± 0.27	2.90 ± 0.36	2.87 ± 0.34	2.88 ± 0.43	2.85 ± 0.46	2.88 ± 0.39
plus/minus SD Total score	8.29 ± 1.19	8.85 ± 0.41	8.87 ± 0.49	7.85 ± 1.72	8.63 ± 0.84	8.56 ± 0.80	8.51 ± 1.06
Intervention Session 3							
plus/minus SD Prompt	5.96 ± 0.19	5.87 ± 0.84	5.98 ± 0.14	5.25 ± 1.71	5.90 ± 0.30	5.85 ± 0.85	5.80 ± 0.90
plus/minus SD Time	3.00 ± 0.00	3.00 ± 0.00	3.00 ± 0.00	2.96 ± 0.28	2.92 ± 0.27	2.98 ± 0.14	2.98 ± 0.17
plus/minus SD Total score	8.96 ± 0.19	8.87 ± 0.84	8.98 ± 0.14	8.21 ± 1.72	8.83 ± 0.47	8.83 ± 0.86	8.78 ± 0.91
Intervention Session 4							
plus/minus SD Prompt	6.00 ± 0.00	5.98 ± 0.14	5.98 ± 0.14	5.54 ± 1.42	5.98 ± 0.14	5.87 ± 0.84	5.89 ± 0.70
plus/minus SD Time	3.00 ± 0.00	3.00 ± 0.00	3.00 ± 0.00	2.96 ± 0.28	2.92 ± 0.27	2.98 ± 0.14	2.97 ± 0.21
plus/minus SD Total score	8.98 ± 0.14	8.96 ± 0.19	8.98 ± 0.14	8.50 ± 1.43	8.87 ± 0.44	8.87 ± 0.84	8.86 ± 0.73

4.71 and 5.79, with a steady increase of 5.54 to 6 during the fourth intervention session. Figure 2 shows the mean for each learner during each session. A statistical difference with a p value of <0.0001 exists between the baseline and session four for each learner and the group as a whole. When comparing sessions one and four for all learners and the group as a whole, a statistical difference with a p value of <0.0001 exists. This indicates that the amount of prompting needed decreased between baseline and Session 4 and between Sessions 1 and 4.

3.3 | Time

The null hypothesis was rejected as the time needed for learners with severe intellectual disability to complete a laundry activity decreased after the implementation of a 4-week intervention programme based on VdTMoCA. The time taken to initiate each step of the activity was indicated in intervals, with a score of 3 indicating that a learner initiated within 0–1 s and 0 indicating that they needed more than 5 s to respond. The time taken to initiate a step

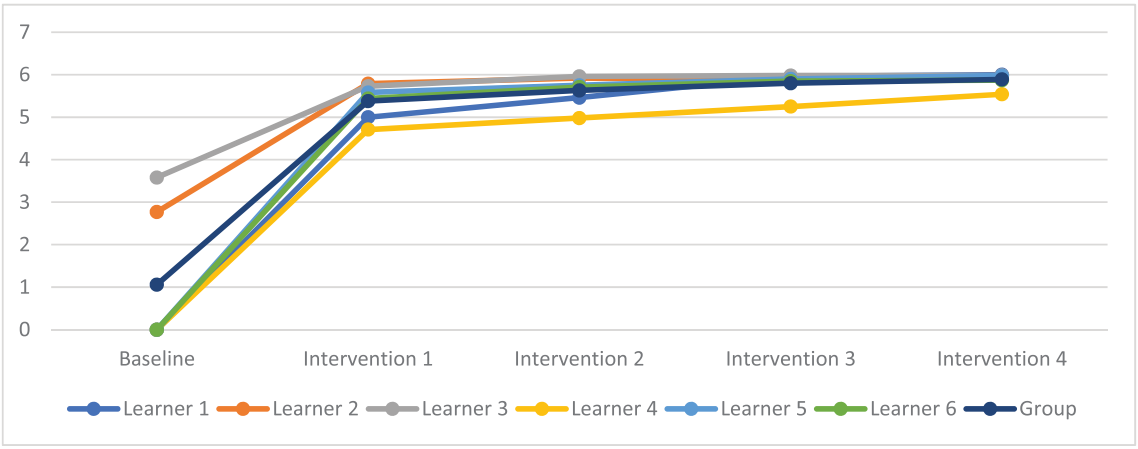

FIGURE 2 | Means of prompt for each learner and group as a whole across all intervention sessions.

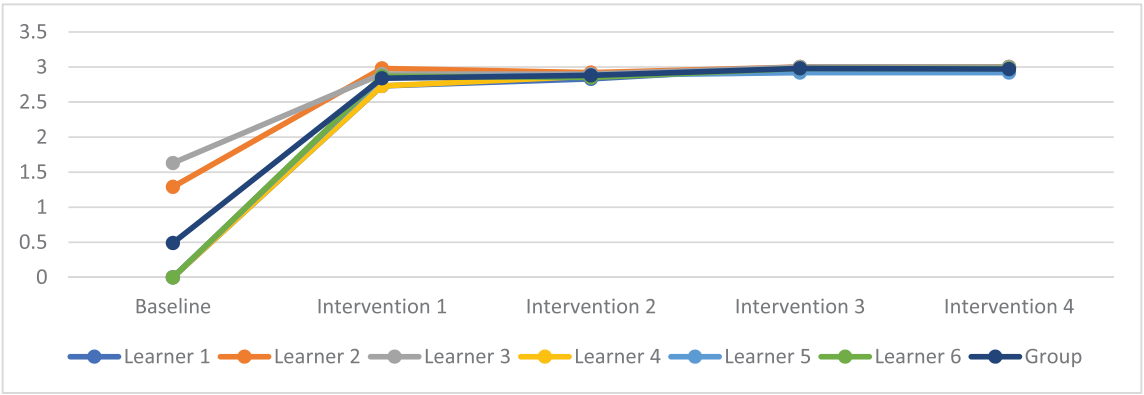

FIGURE 3 | Means of time for each learner and group as a whole across all intervention sessions.

for each child per session is presented in Table 3. The mean of the prompting was calculated across the 52 steps. The means for the total score ranged from 0 to 1.63 at baseline. It increased from 2.73 to 2.98 during the first intervention session and ranged between 2.88 and 3 for the final intervention session. Figure 3 shows the mean for each learner during each session. A statistical difference with a p value of <0.0001 exists between baseline and Session 4 for each learner and the group as a whole. When comparing Sessions 1 and 4 for all learners and the group as a whole, a statistical difference with a p value of <0.0001 exists. This indicates that the amount of time needed to initiate steps decreased between baseline and Session 4 and between Sessions 1 and 4.

3.4 | Level of Independence

The null hypothesis was rejected as the level of independence of learners with severe intellectual disability to complete a laundry activity increased after implementing a 4-week intervention programme based on VdTMoCA. The total level of independence was obtained by combining the level of prompting and time taken to initiate the steps, with a potential score of 9 indicating independence and 0 indicating that a learner needs full assistance. The level of prompting required for each child per session is presented in Table 3. The mean of the prompting was calculated across the 52 steps. The means for the total score ranged from 0 to 5.21 at baseline, and it increased between 7.44 and 8.77 during the first intervention session. It also ranged between 8.50 and 8.98 for the final intervention session. Figure 4 shows the mean for each learner during each session. A statistical difference with a p value of <0.0001 exists between baseline and Session 4 for each learner and the group as a whole. When comparing sessions one and four for all learners and the group as a whole, a statistical difference with a p value of <0.0001 exists. This indicates that the total level of independence between baseline and Session 4 and between Sessions 1 and 4 increased.

4 | Discussion

The primary results of the study indicated a statistically significant decrease in the level of prompting needed for learners with severe intellectual disability to complete a laundry task after implementing a 4-week intervention programme based on the VdTMoCA.

The time taken to initiate each step of the activity also decreased, indicating that VdTMoCA principles aid in improving the overall independence of learners with severe intellectual disability. This correlates with Vona du Toit's early statements that by applying the correct principles, the demands of an activity meet a person's abilities but still require effort to perform, enabling progression in the levels of creative ability and

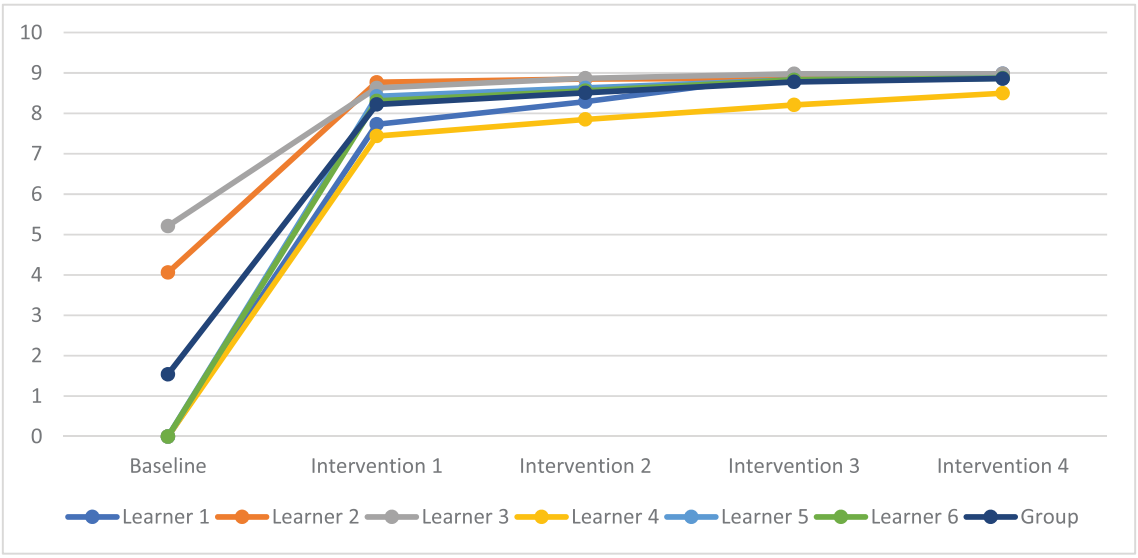

FIGURE 4 | Means for total independence score for each learner and group as a whole across all intervention sessions.

improving independence (du Toit 2009). This study showed that learners at lower levels of creative ability could exert effort and show creative participation as described by van der Reyden et al. (2019).

Systematic development of interventions is a key concept in understanding the adaptation necessary for each step of the activity. This ensures a targeted intervention that addresses the level of functioning of learners with severe intellectual disabilities, as defined by their level of creative ability. This leads to optimal participation, learning and subsequent independence in selected tasks of learners with severe intellectual disability. VdTMoCA literature highlights this by stating that accurate activity analysis is crucial to understanding the demands of an activity and ensuring that it can be adapted to meet the level of creative ability of learners with severe intellectual disabilities (van der Reyden et al. 2019).

Frequent measurements provided information on the small increments of change focused on step-by-step improvements and identified specific aspects of an activity that needed to be adapted for individual learners (Downing 2010; Uys, Alant, and Lloyd 2005). The importance of evaluating each learner's improvement in each step should not be overlooked.

Examples of individual barriers that were observed included participants struggling with judgement during activity participation. Impaired judgement is recognised as one of the characteristics of severe intellectual disability (American Psychiatric Association 2013; Crouch and Allers 2014; Downing 2010), but even with added lines to visually aid the amount of water that he needed, one participant was still unable to pour an acceptable amount of water into the bucket. Several participants displayed difficulty with the bilateral hand task of throwing washing powder into their hands. If the activity had only been evaluated as a whole, it might have appeared that the learners with severe intellectual disability were unable to complete the activity or did not have adequate knowledge of the sequence of steps. However, when looking at each step individually, using activity analysis, the therapist identified performance skills, such as motor control and higher cognitive functioning abilities that inhibited the completion of certain steps. This allows targeted individual adaptations to overcome barriers and ensure increased independence for learners with severe intellectual disability. Most prompts were required at the start of each group of steps. When considering preparing the water, washing the socks, rinsing the socks and hanging the socks as four groups of steps in the activity, study participants generally needed more prompting at the start of each group. Once they completed the first and second steps of a group during Session 4, they were generally able to complete the remaining steps with no prompting or only a gesture needed to complete the consecutive steps. It was further noted that steps repeated during the activity, such as picking up socks, rubbing the socks together and wringing out water, required less prompting when performed the second to fourth time. This supports the findings of other studies that learners with severe intellectual disability can perform IADL tasks that are presented repetitively, with only limited prompting needed (Deppisch 2013; Dollar et al. 2012; Kagohara 2011; Kanfush and Jaffe 2019; Rehfeldt et al. 2003).

Learners with severe intellectual disability often have poor cognitive and motor planning abilities (Downing 2010); therefore, they need more time to initiate steps, even when the level of prompting needed during activity participation decreases. Between Sessions 3 and 4, the learners became more familiar with the sequence of the steps and needed even less prompting to complete the task. The time taken to initiate the steps increased slightly for some steps as the learners could recall the next step of the activity before the next level of prompting was given. However, they required more time to execute the motor and cognitive components of the task.

Development within the level of creative ability was observed. Characteristics that are not expected from a person on self-differentiation were also noted, such as higher cognitive functions, judgement and executing more than two steps in an activity. The fact that some learners displayed these characteristics emphasises the importance of activities presented at the

correct level of creative ability and the effectiveness of the number of repetitions of steps and tasks for people functioning on a self-differentiating level of creative ability.

The limitations of this study are related to the timeframe of data collection. Because of COVID-19 pandemic regulations, a withdrawal period and subsequent assessment were impossible. Therefore, possible skill retention could not be assessed, which could have provided information on the long-term effectiveness of an intervention programme based on the VdTMoCA principles. The multiple cases with a literal replication study design did not include a control group that did not receive intervention, as two homogeneous groups could not be identified in the school. Consequently, skill retention after the withdrawal of the intervention could not be assessed. This would have provided valuable information on the long-term effectiveness of an intervention programme based on VdTMoCA principles. Additionally, the multiple case design with literal replication did not include a control group, as two homogeneous groups could not be identified within the school.

Future research is needed to support these results and to explore the effectiveness of VdTMoCA principles in acquiring other IADL skills, such as self-care tasks, cleaning tasks or using transport. Another purpose for future research is to assess a control group for the same activity without intervention. The same process of intervention programme development can also be followed for learners with severe intellectual disability on other levels of creative ability to assess the effectiveness of VdTMoCA intervention principles on those levels. Similarly, the process can be followed, and intervention implemented for different age groups in learners with severe intellectual disability.

The results of this study can be used to effectively guide the adaption of skills education for learners with severe intellectual disabilities. In practice, OTs and teachers must include therapeutic relationships, structuring and presentation principles from the VdTMoCA according to the level of functioning of learners with severe intellectual disabilities. This will lead to improved participation and lower levels of prompting needed by learners with severe intellectual disability.

Assessment tools should be specifically developed for each intervention plan and sensitive to small changes in behaviour. In practice, this will allow teachers and therapists in a school setting to document small improvements in independence and note small changes (Uys, Alant, and Lloyd 2005). This, in return, motivates them to continue with skills training for learners with severe intellectual disability, as they can see the positive results that the intervention renders. In contrast, should they not note any improvement during an assessment, they can easily alter their intervention approach based on the difficulty that learners with severe intellectual disability experience during activity participation and completion.

5 | Conclusion

A 4-week intervention programme based on the VdTMoCA principles decreased the level of prompting needed and the time it takes for learners with severe intellectual disability to complete a laundry activity. Thus, the null hypothesis—that the level of prompting needed by a learner with severe intellectual disability to complete a laundry activity would decrease after implementing a 4-week intervention programme based on the VdTMoCA—was rejected.

Adapting each activity step according to therapeutic relationship (handling), presentation and structuring principles demonstrated that the VdTMoCA could effectively be implemented during skill acquisition. By providing treatment that correlates with learners with severe intellectual disabilities' level of functioning, they are more likely to obtain a new skill and increase independence in selected tasks. Further research is however necessary to determine the long-term outcomes of such treatment.

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Ethics Statement

Ethical clearance was obtained in terms of the University of Pretoria's Code of Ethics for Researchers and the Policy guidelines for responsible research (Reference Number: 888/2020).

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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