# A Randomized Clinical Trial Targeting Daily Living Skills in Autistic Adolescents Without an Intellectual Disability Before the Transition to Adulthood

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**ABSTRACT:** ***Objectives:*** **In the United States, more than 75,000 autistic adolescents graduate from high school each year, and many lack the skills to successfully transition to college, work, and independent living. Daily living skills (DLS) in autistic adolescents without an intellectual disability (ID) fall 6 to 8 years behind peers. Better DLS are linked to more positive adult outcomes for autistic individuals. Surviving and Thriving in the Real World (STRW) is the only known evidence-based intervention that targets age-appropriate DLS in autistic adolescents without ID. The study objective was to evaluate STRW's efficacy compared with an active comparator (Program for the Evaluation and Enrichment of Relational Skills [PEERS]).** ***Method:*** **Autistic adolescents in their last 2 years of high school were randomized to STRW or PEERS. Outcome measures were the Vineland Adaptive Behavior Scales, Third Edition (VABS-3), DLS domain and subdomains (Personal, Domestic, Community), and DLS Goal Attainment Scaling (DLS-GAS) areas (Morning Routine, Cooking, Laundry, Money).** ***Results:*** **Adolescents were randomly assigned to STRW (n = 34) or PEERS (n = 30). Owing to COVID-19, 28.1% received in-person intervention and 71.9% received telehealth intervention. STRW youth made significant gains on the VABS-3 DLS domain ($p = 0.01$) and Domestic subdomain ($p = 0.005$) and DLS-GAS Total, Laundry, and Money areas (all $p$'s < 0.05) compared with PEERS.** ***Conclusion:*** **STRW shows promise for acquiring age-appropriate DLS compared with PEERS. Adolescents in STRW progressed toward achieving DLS in the average range and closing the gap between chronological age and DLS. By improving DLS, STRW may facilitate more successful adult outcomes.**

(*J Dev Behav Pediatr* 00:1–7, 2023) **Index terms:** autism, adaptive behavior, daily living skills, intervention, adolescence.

Autism spectrum disorder (ASD) is characterized by social communication difficulties and restricted and repetitive behaviors and interests.[1] While more than half of autistic individuals have average or above cognitive abilities (i.e., intelligence quotient [IQ] > 70),[2] they have suboptimal adult outcomes[3] even when compared with individuals with other neurodevelopmental disabilities.[4] A recent study used operationally defined criteria to examine outcomes in autistic adults without an intellectual disability (ID) and found that only one-third of autistic adults achieved positive outcomes in all 3 areas: purpose (i.e., working, attending college), autonomy (i.e., living independently), and social relationships (i.e., friendships with peers).[5] These findings are consistent with cross-sectional and longitudinal studies which have shown that autistic individuals struggle to achieve successful adult outcomes[3,6,7] and have decreased quality of life.[8]

Daily living skills (DLS) are the tasks that individuals do to take care of themselves at home, school, and in the community.[9] Autistic adolescents without an ID have DLS that fall far below what would be expected based on their age[10] such that they are often 6 to 8 years behind their same-age peers.[11,12] This gap between age and DLS is present in early childhood and continues to widen over time.[13] Age-appropriate DLS have been linked to more successful outcomes for autistic adults in attending and graduating from college, finding and keeping jobs, living independently, and achieving positive well-being.[6,14] Given the relationship between higher DLS and better adult outcomes, interventions that target DLS may facilitate a more successful transition from high school to adulthood for autistic adolescents.[6,10,12]

Our team has been iteratively developing and evaluating the only known intervention that targets critical, age-appropriate DLS for autistic adolescents without ID. Specifically, the Surviving and Thriving in the Real-World

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(STRW)[15] intervention incorporates known evidence-based strategies[16] such as reinforcement, task analysis, and visual supports to address critical DLS, including hygiene, laundry, cooking, and managing money. STRW was developed with significant input from both adolescent and caregiver stakeholders to increase feasibility, acceptability, and buy-in.

In a single-arm feasibility and efficacy study of STRW,[17] autistic adolescents (n = 7) made significant improvements on the Vineland Adaptive Behavior Scales, Second Edition (Vineland-II)[18] DLS domain from baseline to post-treatment that were maintained at 6-month follow-up. Next, we conducted a feasibility randomized clinical trial (RCT; n = 12) comparing adolescents who received STRW with a wait-list control group. STRW participants made significant gains on the Vineland Adaptive Behavior Scales, Third Edition (VABS-3)[9] DLS domain and Personal subdomain raw scores and also on individualized hygiene and self-care goals as assessed by Goal Attainment Scaling (GAS)[19] compared with the control group.[20] In addition, when control group participants crossed over to complete STRW, we found that the combined sample of adolescents who completed STRW made significant gains in the VABS-3 DLS domain, all VABS-3 DLS subdomains, and all GAS areas. Furthermore, the VABS-3 DLS domain standard score (M = 100, SD = 15) increased by 15 points such that STRW participants moved into the "average range." Autistic adolescents also gained 4 to 7 years of DLS in the Personal, Domestic, and Community subdomains from baseline to 6-month follow-up.[20]

In the next iteration of intervention development, which is the primary objective of this study, we conducted a pilot RCT of STRW targeting autistic adolescents without ID in their last 2 years of high school compared with an active control group (i.e., social skills intervention). This age group was chosen to take advantage of the need for acquisition and mastery of DLS given the impending transition from high school to the adult world and to build on the real-life experiences adolescents typically have in their last 2 years of high school (e.g., working a part-time job, preparing to attend college). We hypothesized that compared with adolescents in the control group, adolescents in STRW would make greater DLS gains on the (1) VABS-3 DLS domain and 3 DLS subdomain raw scores and (2) individualized Morning Routine, Cooking, Laundry, and Money Management goals as assessed by GAS.

# METHODS

## Participants

Adolescent participants met the following inclusion criteria: (1) enrolled in 11th or 12th grade in high school, (2) diagnosis of ASD, (3) full-scale IQ > 70, and (4) DLS deficit on the VABS-3 caregiver interview form (i.e., DLS domain or subdomain score at least 15 points below IQ).

## Recruitment of Study Sample

Adolescent and caregiver participants were recruited using several methods including opt-out postcards mailed to families of patients in an ASD outpatient clinic, flyers distributed to schools and community organizations, and direct clinician referral.

## Study Design

We examined the effect of the STRW intervention on DLS (as assessed by the VABS-3 and DLS-GAS) compared with an active control group (i.e., Program for the Evaluation and Enrichment of Relational Skills [PEERS]). Randomization to STRW or PEERS was conducted using a computer-generated list by an individual independent of the study. The primary DLS outcome measures (i.e., VABS-3, DLS-GAS) were completed by a research coordinator masked to participants' intervention assignment.

## Procedures

Caregivers completed a phone screening and those who met inclusion screening criteria and expressed interest were scheduled for an in-person baseline assessment to determine eligibility. The Autism Diagnostic Observation Schedule, Second Edition,[21] was administered to the adolescent to verify the autism diagnosis. The Stanford-Binet Intelligence Scales, Fifth Edition,[22] abbreviated battery was used to assess IQ (n = 72); however, the WISC-5[23] assessment was allowed for 1 teen to decrease participant burden. The VABS-3 was administered to confirm the adolescent had deficient DLS. If inclusion criteria were met, participants were enrolled in the study. Once a cohort of 10 to 16 adolescents was enrolled, participants were randomized to STRW or control and began the intervention within 2 weeks. This study was approved by the institutional review board for human subjects, and written informed consent was obtained at the baseline assessment from the caregiver and adolescent before data collection. All post-treatment assessments were completed within 2 weeks of completing the interventions.

## Intervention Groups

### Surviving and Thriving in the Real World

Surviving and Thriving in the Real World (STRW) is a 14-session manualized intervention that targets age-appropriate DLS in autistic adolescents (see Table 1). A detailed description of the STRW intervention protocol has been published elsewhere.[15] In-person STRW consisted of weekly caregiver groups and teen groups that met concurrently for 90 minutes. Owing to the COVID-19 restrictions on in-person treatment that were implemented in March 2020, STRW was converted to telehealth. Similar to in-person STRW, STRW-telehealth (STRW-T) consisted of weekly caregiver groups (90 minutes), but the weekly teen groups were converted to weekly caregiver/teen dyad sessions (60 minutes) to



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**Table 1.** Content of STRW Sessions

| Session | STRW Content |
|---|---|
| 1 | Overview of STRW—importance of targeting DLS to meet goals in adulthood |
| 2 | Morning Routine—basic hygiene and self-care tasks, breaking down steps in morning routine |
| 3 | Morning Routine—develop contact with morning routine as first goal to be targeted |
| 4 | Laundry—sort clothes, do laundry using a washing machine |
| 5 | Laundry—do laundry using a dryer, develop system to fold, and put clean clothes away |
| 6 | Kitchen/Cooking—safe kitchen practices, no-cook recipes, cook in the microwave |
| 7 | Kitchen/Cooking—mix and measure ingredients, cook in the oven |
| 8 | Kitchen/Cooking—clean the kitchen using a checklist, cook on the stove |
| 9 | Grocery Shopping—navigate and purchase items at the grocery store, put groceries away at home |
| 10 | Money Management—increase understanding of spending money (cost, quality, need vs want) |
| 11 | Money Management—use a checking and/or savings account; use a debit card, money diary, savings contract |
| 12 | Money Management—save up for items, create and stick to a weekly/monthly budget |
| 13 | Money Management—plan an event with a predefined budget |
| 14 | Party/Graduation—review progress made during STRW and set future DLS goals |

DLS, daily living skills; STRW, Surviving and Thriving in the Real World.

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allow for practice of specific DLS being taught at those sessions.[15]

### Control Condition: Program for the Evaluation and Enrichment of Relational Skills

Program for the Evaluation and Enrichment of Relational Skills targets social skills including having conversations and increasing interactions with peers using direct instruction, role play, and homework assignments.[24] PEERS was chosen as an active comparison because it targets the core deficit of social skills for autistic adolescents, but does not provide instruction on DLS. PEERS is similar to STRW in structure, number, and duration of sessions. PEERS was converted to telehealth (PEERS-T) when COVID-19 restrictions were implemented and consisted of weekly caregiver and teen groups that met concurrently for 90 minutes.[25]

## Primary Daily Living Skills Outcome

The VABS-3[9] assesses adaptive behavior and the DLS domain consists of the Personal, Domestic, and Community subdomains. The primary outcome measures were changes in the VABS-3 DLS domain and subdomain raw scores from baseline to post-treatment. VABS-3 DLS domain and subdomain raw scores are more sensitive to progress as indicated by increases in individual items[6,10,17,20] and have been used in previous studies of STRW.[17,20] Age-equivalent scores are calculated from the DLS subdomain raw scores and were used as an indicator of clinical impact. Changes in the standard score from baseline to post-treatment were used as a measure of clinical meaningfulness. Caregivers rate their child's ability to perform a task independently as usually, sometimes, or never with higher scores indicating higher DLS.

## Secondary Daily Living Skills Outcome

Goal attainment scaling considers that individuals have different baseline levels of skills and uses a standardized scale to assess progress toward individualized goals.[19] GAS uses structured guidelines when developing goals using a 5-point rating scale ranging from −2 (i.e., present level of performance) to +2 (i.e., much more progress than expected). The goal is to progress from −2 to 0, which is indicative of 100% better performance. Our team developed the DLS-GAS,[17,20] which is a caregiver interview that assesses DLS in the Morning Routine, Laundry, Cooking, and Money Management areas. At baseline, caregivers report on whether DLS are performed independently in all 4 DLS-GAS areas and then create a goal to target in each area. All DLS goals are rated as a −2 at baseline. At post-treatment, caregivers report on the progression of each goal and are given a rating based on the adolescent's progress since baseline. A change score was calculated for GAS median ratings from baseline to post-treatment. Three GAS criterion measures (i.e., measurability, equivalence, level of difficulty)[26] were used to ensure comparability of goals between groups.

## Attendance, Fidelity, Homework Completion, and Participant Satisfaction Measures

Therapists recorded attendance at every session. All STRW sessions were video-recorded, and 20% of teen and caregiver groups and 10% of dyad sessions were independently coded for fidelity by trained coders. Beginning in Session 4, therapists completed a homework-check in to (1) assess the use of a contract to target DLS goals and (2) identify the specific DLS goals (i.e., morning routine, laundry, cooking, grocery shopping, money) that were being targeted on the contract after they had been introduced in STRW sessions. At each STRW session, participants anonymously rated their satisfaction with session components on a 5-point scale (i.e., 1 being not helpful and 5 being very helpful).

## Analysis Plan

Descriptive statistics were generated for demographics, attendance, attrition, fidelity, homework compliance, and satisfaction. An intention-to-treat approach was used to assess the change in primary and secondary DLS outcomes over time as a function of participants who completed the intervention groups (STRW vs PEERS). General linear models (GLM) were constructed to evaluate mean change in primary VABS-3 DLS outcomes within groups. Variables that were not balanced between groups were included as covariates in the model; IQ remained in all models. In addition, baseline values of each outcome were included in the models to control for


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potential differences in these outcomes at baseline. To control for a potential clustering effect of cohort, we included a variable for cohort in the repeated statement. The results were reported as adjusted least square means (LSmeans) with standard errors. Effect sizes were also reported with Cohen's d. Baseline and post-treatment VABS-3 scores were reported as LSmeans adjusted for the same covariates included in the outcome models. Differences between groups regarding median changes in the DLS-GAS scores were assessed using the Wilcoxon rank-sum test. We conducted a sensitivity analysis to evaluate whether telehealth vs in-person affected outcomes. Statistical significance was set at $p < 0.05$. All analyses were conducted using SAS version 9.4.[27]

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## RESULTS

See Supplemental Digital Content 1, http://links.lww.com/JDBP/A435, for CONSORT diagram. A total of 64 participants completed STRW (n = 34) or PEERS (n = 30). Two cohorts (total n = 18) received in-person STRW (n = 10) and PEERS (n = 8). One in-person cohort (total n = 13) was suspended in March 2020 after 2 sessions and was restarted in June 2020 such that participants received STRW (n = 6) or PEERS (n = 7) through telehealth. The remaining 3 cohorts received STRW (n = 18) and PEERS (n = 15) through telehealth (total n = 33).

Participant characteristics of the entire sample are shown in Table 2. The 2 groups were significantly different on age, IQ, and VABS-3 Communication. Groups did not differ on the VABS-3 DLS domain or subdomains (all $p$'s $> 0.52$).

### Attendance and Attrition

Approximately 87.7% of participants (64 of 73) completed the interventions—94.4% in STRW (34 of 36) and 81.1% in PEERS (30 of 37). There was no difference in dropout between groups ($p = 0.16$). For in-person STRW, attendance rates for caregiver and teen group sessions were 88.6%. For STRW-T, attendance for the caregiver group was 89.9% and 99.1% for dyad sessions. Telehealth dyad sessions were attended at higher rates than in-person teen sessions ($p < 0.001$). For in-person PEERS, attendance for the caregiver and teen group sessions was 87.5%. For PEERS-T, the attendance rate for the caregiver group was 91.4% and 91.0% for the teen group. There were no differences for attendance between telehealth and in-person PEERS (all $p$'s $> 0.22$).

### Fidelity

Fidelity rates for in-person STRW were 88.8% (caregiver) and 90.3% (teen). For STRW-T, fidelity rates were 96.0% (caregiver) and 93.8% (dyad).

### Primary Daily Living Skills Outcome

#### Vineland Adaptive Behavior Scales, Third Edition

The adjusted means and standard deviations of the raw scores on the VABS-3 DLS domain and subdomains at baseline and post-treatment are shown in Table 3. The results of the GLMs revealed that the STRW group made significantly more gains on the DLS domain ($p = 0.01$) and the Domestic subdomain ($p = 0.005$) compared with PEERS. STRW participants gained 34.7 points on the VABS-3 DLS domain raw score compared with the 28.0 point gain demonstrated by PEERS participants. There was not a significant difference between the STRW and

**Table 2.** Demographic Characteristics of Participants Meeting Inclusion Criteria for STRW or PEERS

| | STRW (n = 36) | PEERS (n = 37) | p |
|---|---|---|---|
| Age at study entry, y mean (SD) | 17.3 (0.7) | 16.9 (0.8) | 0.04[a] |
| Sex at birth, n (%) | | | 0.46 |
| Male | 28 (77.8) | 26 (70.3) | |
| Female | 8 (22.2) | 11 (29.7) | |
| IQ, mean (SD) | 93.4 (10.2) | 99.2 (11.3) | 0.03 |
| VABS-3 standard scores | | | |
| Communication domain | 66.2 (13.2) | 70.0 (13.5) | 0.03 |
| DLS domain | 58.3 (19.0) | 65.9 (18.2) | 0.08 |
| Socialization domain | 65.1 (11.9) | 65.1 (13.2) | 0.99 |
| Adaptive Behavior Composite | 63.3 (10.5) | 66.6 (11.8) | 0.21 |
| VABS-3 DLS raw scores | | | |
| Personal subdomain | 92.2 (9.1) | 93.0 (8.1) | 0.71 |
| Domestic subdomain | 30.3 (15.3) | 32.5 (14.3) | 0.54 |
| Community subdomain | 74.7 (10.7) | 76.1 (14.9) | 0.64 |
| DLS domain | 197.2 (26.5) | 201.5 (29.9) | 0.52 |
| ADOS comparison score | 6.8 (2.0) | 7.1 (1.5) | 0.56 |
| Race | | | 0.73[a] |
| White | 28 (77.8) | 29 (78.4) | |
| Black | 5 (13.9) | 5 (13.5) | |
| Asian | 0 | 2 (2.7) | |
| More than 1/Other | 3 (8.3) | 2 (5.4) | |
| Ethnicity | | | 0.55[a] |
| Hispanic | 2 (5.6) | 4 (10.8) | |
| Non-Hispanic | 34 (94.4) | 32 (86.5) | |
| Not reported | 0 (0.0) | 1 (2.7) | |
| Household income | | | 0.37[a] |
| <$20,000 | 2 (5.6) | 3 (8.1) | |
| $20K–49.9K | 2 (5.6) | 8 (21.6) | |
| $50K–99.9K | 12 (33.3) | 10 (27.0) | |
| >$100K | 18 (50.0) | 14 (37.8) | |
| Not reported | 2 (5.6) | 2 (5.4) | |
| Primary caregiver education | | | 0.40[a] |
| High school degree/GED | 2 (5.6) | 2 (5.4) | |
| Some college | 6 (16.7) | 2 (5.4) | |
| College degree (associates or bachelor) | 15 (41.7) | 22 (59.5) | |
| Graduate degree | 12 (33.3) | 9 (24.3) | |
| Not reported | 1 (2.8) | 2 (5.4) | |
| Lost to follow-up | 2 (5.6) | 7 (18.9) | 0.16 |

[a]Fisher's exact test. ADOS, Autism Diagnostic Observation Schedule; PEERS, Program for the Evaluation and Enrichment of Relational Skills; STRW, Surviving and Thriving in the Real World; VABS-3, Vineland Adaptive Behavior Scales, Third Edition.



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**Table 3.** Adjusted Mean VABS-3 DLS Domain and Subdomain Raw Scores from Baseline to Post-treatment

| | STRW (n = 31) | | | | PEERS (n = 30) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Base | Post-treatment | Change Score | Cohen's d | Base | Post-treatment | Change Score | Cohen's d | $p^a$ | Cohen's d[b] |
| Personal | 91.5 (1.5) | 99.7 (1.1) | 7.5 (0.9) | 0.94 | 93.5 (1.5) | 100.3 (1.1) | 7.5 (0.8) | 1.05 | 0.99 | 0.00 |
| Domestic | 29.8 (2.6) | 44.9 (2.0) | 14.1 (0.8) | 1.06 | 32.6 (2.6) | 42.2 (2.0) | 10.8 (1.2) | 0.82 | 0.005 | 0.34 |
| Community | 74.5 (2.2) | 87.6 (2.3) | 12.9 (1.5) | 0.99 | 75.6 (2.2) | 85.4 (2.4) | 10.0 (1.6) | 0.76 | 0.13 | 0.26 |
| Total DLS | 195.7 (4.6) | 232.2 (4.4) | 34.7 (1.0) | 1.30 | 201.7 (4.7) | 227.9 (4.4) | 28.0 (2.5) | 1.05 | 0.01 | 0.32 |

Change score results reported as LSMeans with standard errors from GLM after controlling for baseline value and IQ. [a]*p*-value based on general linear models testing the difference in change from baseline to postscores between intervention groups. [b]Cohen's d of the adjusted mean change score difference between the 2 groups. GLM, general linear models; LSmeans, least square means; PEERS, Program for the Evaluation and Enrichment of Relational Skills; STRW, Surviving and Thriving in the Real World; VABS-3, Vineland Adaptive Behavior Scales, Third Edition.

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PEERS groups on the VABS-3 Personal ($p$ = 0.99) or Community ($p$ = 0.13) subdomain raw scores. The VABS-3 DLS domain standard score for the STRW group was 56.2 (19.1) at baseline and 76.6 (15.2) at post-treatment. The VABS-3 DLS domain standard score for the PEERS group was 67.8 (17.3) at baseline and 80.3 (13.5) at post-treatment.

The results of the sensitivity analysis testing whether delivery (telehealth vs in-person) affected outcomes were consistent with the primary analysis. The type of intervention delivery was not significant ($p > 0.9$) for change in the Personal ($p$ = 0.98) and Community ($p$ = 0.64) subdomain raw scores and the Total DLS raw score ($p$ = 0.97). For the Domestic subdomain, individuals who received the in-person intervention had a slightly higher raw score ($\beta$ = 2.9 (SE 1.2), $p$ = 0.02) compared with those receiving telehealth. However, the difference in the adjusted mean change scores of the Domestic subdomain was consistent with the original analysis (STRW 14.8 vs PEERS 11.4, $p$ = 0.007).

## Secondary Daily Living Skills Outcome

### Daily Living Skills–Goal Attainment Scaling

Medians for the 4 DLS-GAS areas, Total DLS-GAS, and the change scores from baseline to post-treatment are shown in Table 4. At baseline, there were no differences on the 3 criterion measures of measurability, equidistance, and level of difficulty between STRW and PEERS ($p$'s ranged from 0.17 to 0.86). A Wilcoxon rank-sum test revealed that the STRW group had significantly higher median change scores in Total ($p$ = 0.05), Laundry ($p$ = 0.01), and Money Management ($p$ = 0.02) compared with PEERS. There was not a significant difference between groups in Morning Routine ($p$ = 0.56) or Cooking ($p$ = 0.09).

## Surviving and Thriving in the Real-World Treatment Satisfaction and Homework Completion

Teens reported high mean satisfaction ratings for in-person STRW (3.73–4.38) and STRW-T (3.74–4.65). Caregivers reported high mean satisfaction ratings for in-person STRW (ranged from 4.54 to 4.92), STRW-T (4.28–4.88), and STRW-T dyads (3.94–4.87). There were no significant differences between mean satisfaction ratings for in-person vs telehealth (all $p$'s > 0.18).

### Homework Completion

For in-person STRW, homework completion rates were the following for caregiver and teen sessions, respectively: (1) Contract 77.4% and 86.6%; (2) Morning Routine 92.1% and 92.8%; (3) Laundry 76.3% and 79.2%; (4) Cooking 62.0% and 47.3%; (5) Grocery Shopping 60.0% and 31.3%; and (6) Money 57.4% and 46.1%. For STRW-T, rates were the following for caregiver and teen dyads: (1) Contract 93.3%; (2) Morning Routine 95.4%; (3) Laundry 89.9%; (4) Cooking 64.5%; (5) Grocery Shopping 66.0%; and (6) Money 70.3%. Telehealth dyads reported targeting goals using the contract ($p$ = 0.03) at higher rates than in-person STRW caregivers.

# DISCUSSION

The primary goal of this study was to assess the efficacy of the STRW intervention on increasing DLS in autistic adolescents compared with an active control group (i.e., PEERS). The current results are promising and suggest that the gap between actual DLS and expected,

**Table 4.** Median Item Scores and Change Scores with Interquartile Range in Brackets on the DLS-GAS for STRW and PEERS

| | STRW Median (IQR) | PEERS Median (IQR) | $p^a$ |
|---|---|---|---|
| Baseline | −2.0 (0.0) | −2.0 (0.0) | — |
| Morning routine | | | |
| Post-treatment | −1.0 [−2.0, −0.3] | −1.0 [−2.0, −0.5] | |
| Change score | 1.0 [0–1.8] | 1.0 [0.0, 1.5] | 0.56 |
| Kitchen/Cooking | | | |
| Post-treatment | −0.5 [−2.0, 1.0] | −1.5 [−2.0, −1.0] | |
| Change score | 1.5 [0.0, 3.0] | 0.5 [0.0, 1.0] | 0.09 |
| Laundry | | | |
| Post-treatment | −0.5 [−1.0, 1.0] | −1.0 [−2.0, −0.5] | |
| Change score | 1.5 [1.0, 3.0] | 1.0 [0.0, 1.5] | 0.01 |
| Money management | | | |
| Post-treatment | −1.0 [−2.0, 1.0] | −2.0 [−2.0, −1.0] | |
| Change score | 1.0 [0.0, 3.0] | 0.0 [0.0, 1.0] | 0.02 |
| Total DLS-GAS | | | |
| Post-treatment | −0.6 [−1.3, −0.3] | −1.0 [−1.4, −0.6] | |
| Change score | 1.4 [0.8, 1.8] | 1.0 [0.6, 1.4] | 0.05 |

[a]The *p*-values of the median scores were reported using the Wilcoxon rank-sum test. IQR = interquartile range; PEERS, Program for the Evaluation and Enrichment of Relational Skills; STRW, Surviving and Thriving in the Real World.


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age-appropriate DLS for autistic adolescents without ID can be narrowed with a short-term DLS intervention. Adolescents in STRW demonstrated larger improvements in their VABS-3 DLS domain raw score from baseline to post-treatment compared with PEERS. The VABS-3 DLS domain standard score is often used by clinicians to guide case conceptualization and treatment such that the expectation for autistic adolescents without an ID would be to have a standard score in the average range. Adolescent participants in STRW gained over 20 points on their VABS-3 DLS domain standard score from baseline to post-treatment compared with a 12-point gain by youth in PEERS. This DLS gain for teens in STRW is the largest we have seen throughout our intervention development work and is clinically meaningful because the teens progressed to a mean DLS domain standard score of 76.6, which is much closer to the average range.

Autistic adolescents also made significant improvements in the VABS-3 DLS Domestic subdomain raw score that translated to a gain of 3.6 years of skills (i.e., age equivalent) compared with a gain of only 2.2 years of skills for adolescents in PEERS. This again suggests that STRW may be effective at narrowing the gap between actual DLS and age-appropriate DLS. As domestic skills are often the most impaired in autistic adolescents,[28,29] improvements in these specific DLS (e.g., cooking, cleaning, doing laundry) could have far reaching implications for living independently in adulthood.

The gains made by STRW participants in the VABS-3 Personal and Community subdomains were not significantly different from participants in PEERS. One reason for the lack of findings on the Community subdomain may be that "mastering" an item such as budgeting money for expenses may require additional practice beyond the end of treatment as the adolescent becomes increasingly independent. On the Personal subdomain, these findings may be due to a ceiling effect because both groups had adjusted mean raw scores between 92 and 94 at baseline, and both progressed to a mean raw score of 100 (of a possible score of 110) at post-treatment. This suggests that most of the DLS on the Personal subdomain may have already been acquired by teens. Alternatively, for both the Personal and Community subdomains, the lack of differences between the 2 groups may be due to the VABS-3 assessing items not targeted in STRW (e.g., making healthy eating choices) and/or not capturing the specific DLS taught in STRW (e.g., shaving, rinsing shampoo, setting an alarm to wake up, packing backpack). While the VABS-3 is often the gold-standard assessment of DLS, it may not be the best tool for accurately capturing the gains of those who received the STRW intervention.

The DLS-GAS differs from the VABS-3 in that it measures progress on individualized DLS goals that are created by caregivers and targeted in the STRW intervention. Interestingly, the findings from the individualized DLS-GAS goals suggest that the STRW intervention leads to improvements in both community (i.e., Money Management) and domestic (i.e., Laundry and Cooking) DLS compared with the PEERS intervention. On the DLS-GAS Money Management area, STRW youth made median gains of 50.0% compared with 0% gains made by PEERS youth, which suggests that STRW does indeed affect acquisition of skills related to managing one's personal finances. Similar to the gains on the VABS-3 DLS Domestic subdomain, STRW participants showed significant improvements in Laundry (75.0% progress in STRW vs 50.0% progress in PEERS) and were trending toward significance in Cooking (75.0% progress in STRW vs 25.0% progress in PEERS). However, in line with the findings on the VABS-3 Personal subdomain, adolescents in STRW did not make significant gains in the Morning Routine area. Overall, the DLS-GAS seems to be a complementary assessment to the VABS-3 and may be more sensitive at capturing individual progress in specific DLS targeted in STRW.

This study demonstrated that STRW had high rates of attendance, satisfaction, and completion of the weekly contract and homework assignments on targeted DLS goals with both delivery modalities. Furthermore, outcomes on the VABS-3 DLS domain did not differ based on delivery type. Anecdotally, we observed several benefits of telehealth delivery including attendance (e.g., flexible rescheduling), recruitment from a larger geographical area, and caregiver burden (e.g., decreased travel time). The STRW-T intervention was also less burdensome to implement because fewer therapists are needed (e.g., 1 therapist can facilitate both the caregiver and dyad telehealth sessions instead of 3–4 therapists for the concurrent caregiver and adolescent in-person groups), and less materials are required (e.g., most families had access to a stove and washer and dryer). The STRW-T dyad sessions also allowed for the caregiver and teen to practice a DLS together (e.g., cooking on their own stovetop) with coaching from a therapist before creating a weekly goal for the adolescent to work toward achieving (e.g., cook spaghetti for the family 1 time per week). A disadvantage of STRW-T is that adolescents do not interact with one another, leading to fewer opportunities for normalization of DLS challenges and less exposure to how other teens used strategies to build DLS.

This study has several limitations that should be addressed in future studies. First, STRW was abruptly switched from in-person to telehealth (see Duncan et al., 2021), and while we found no differences in outcomes due to modality, a fully powered trial should be conducted on STRW-T. Second, while the sample size was larger than previous studies, a larger sample of participants is warranted to assess the characteristics of treatment responders. Third, the outcome measures were based on caregiver report and did not take the adolescent's perspective into account. There is a potential for bias because caregivers invested effort into the intervention and were aware of the intervention that they were receiving. Finally, it is not possible to assess the long-term sustainability of DLS gains because post-



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treatment assessments were collected shortly after intervention completion. Future studies should use a multimethod assessment of DLS (e.g., survey, interview, GAS, daily phone diaries) from adolescents and caregivers to comprehensively and objectively assess DLS and the maintenance of DLS gains at long-term follow-ups. Finally, the current sample lacked diversity (e.g., income, race). Future studies should assess the efficacy of STRW-T with a more diverse sample of autistic adolescents and examine the impact of improved DLS on adult outcomes in employment, college, and quality of life.

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