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Caregiving reward trajectories and outcomes among family caregivers of persons living with dementia: A two-year longitudinal study

Ya-Hui Chou
School of Nursing, College of Medicine, Chang Gung University
Yea-Ing L. Shyu
yeaing@mail.cgu.edu.tw

School of Nursing, College of Medicine, Chang Gung University
Yen-Kuang Lin
Graduate Institute of Athletics and Coaching Science, National Taiwan Sport University
Wen Chuin Hsu
Dementia Center, Department of Neurology, Taoyuan Chang Gung Memorial Hospital

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Abstract

Background

This two-year study examined trajectories of caregiving reward domains—*being there*, *meaning*, and *learning*—among family caregivers of persons living with dementia and their relationships with caregiver outcomes.

Methods

This longitudinal study followed 200 family caregivers from neurology clinics in Taiwan, assessing caregiving rewards, role strain, health-related quality of life, and depressive symptoms at baseline, 1-year, and 2-year follow-ups. Group-based trajectory modeling identified reward subgroups; generalized estimating equations tested longitudinal associations with outcomes.

Results

Each reward domain yielded three trajectories (high, medium, low). Reward levels were stable over time, except *learning* rewards, which increased linearly (p = .01), especially among caregivers with low baseline levels. Higher-reward trajectories were associated with lower role strain (β = -0.52 to -0.27), fewer depressive symptoms (β = -10.10 to -4.90), and better mental health (β = 7.66 to 11.28). *Meaning* rewards were associated with better physical health at high and medium levels (β = 5.92 and 5.83, respectively).

Conclusion

Three trajectory groups were identified per domain. Higher trajectories for *meaning* and *learning* were associated with better psychological outcomes; high *meaning* alone predicted better physical health. *Learning* rewards appeared dynamic and experience-responsive. Findings should be interpreted cautiously given the convenience sample and unadjusted models.

Clinical trial number:

not applicable

Background

Family caregivers of persons living with dementia (PLWD) are the foundation of home-based care, yet sustained caregiving places significant demands on their health and well-being. In Taiwan, over 90% of

people with dementia may reside in the community and receive care from family members [1], a pattern that reflects both the structure of the healthcare system and the influence of filial norms on caregiving decisions. The prevalence of dementia among individuals aged ≥ 65 years has reached 12.3% in Taiwan [2], and approximately 60% of PLWD experience behavioral and psychological symptoms that increase in complexity as the condition progresses [3]. By 2041, the number of PLWD in Taiwan is anticipated to reach nearly 680,000 [2], underscoring the urgency of developing sustainable, person-centered models of home-based care.

Positive aspects of caregiving (PAC), defined as the benefits and personal growth perceived by family members, mitigate the negative effects of caregiving. A robust body of literature focuses on these positive effects to understand their potential for promoting mental health and fostering resilience [4–7]. Evidence indicates that PAC correlates with caregiver well-being, including lower burden, reduced depressive symptoms, and enhanced life satisfaction [5, 8–9]. Furthermore, PAC can decrease behavioral problems in caregivers and enhance their responsiveness to interventions that strengthen competence or positive reappraisal [10]. Multi-component interventions have also been shown to bolster PAC, thereby improving overall well-being [11]. These findings underscore the value of understanding individual differences in PAC to inform targeted clinical interventions.

Building on this perspective, prior research conceptualizes PAC as specific caregiving rewards. Within their roles, family caregivers often report rewards such as emotional closeness (mutuality), finding purpose through being helpful, and experiencing personal growth, such as when learning new skills [4, 12–13]. Three dimensions of caregiving rewards have been identified: *being there* for the person living with dementia (PLWD), finding *meaning* for oneself, and *learning* from the caregiver role [12]. Although some caregivers derive rewards from altruistic motives aimed at improving the care recipient's well-being, others focus on personal growth [13]. Empirical studies show that caregivers with a greater sense of meaning are less likely to report burden and role captivity [14]. These rewards also influence PLWD outcomes; for instance, Higher baseline caregiving rewards were associated with lower depression scores in patients at follow-up [15].Furthermore, finding meaning contributes to the maintenance of the caregiving role [13] and care recipients of rewarded caregivers often report gratitude and active, problem-oriented coping [16].

However, the longitudinal evolution of specific rewards remains unexplored. Prior research predominantly relies on cross-sectional designs, offering only a static snapshot that overlooks the dynamic heterogeneity of the caregiving journey. This study addresses this gap by examining the longitudinal trajectories of three specific caregiving rewards—*being there*, *meaning*, and *learning*—among family caregivers of PLWD over a two-year follow-up period. Two hypotheses guided the study. First, it was hypothesized that distinct trajectory subgroups would emerge within each reward domain, reflecting meaningful variation in caregivers' longitudinal reward profiles. Second, it was hypothesized that caregivers in higher-reward trajectory groups would report lower role strain and depressive symptoms, and better mental health than those in lower-reward groups. A trajectory-based approach was used to identify distinct subgroups of caregivers following diverging reward profiles, and to examine the

longitudinal associations between trajectory membership and caregiver outcomes including role strain, depressive symptoms, and health-related quality of life. Clinically, identifying these patterns may enable gerontological nurses to detect individuals following persistently low-reward trajectories early and to tailor support to a caregiver's specific adaptation profile.

Methods

Study Design

This study employed a two-year longitudinal correlational design to examine the developmental trajectories of caregiving rewards and their associations with outcomes among PLWD.

Participants

Family caregivers were recruited using convenience sampling from neurology outpatient clinics, inpatient wards, and day care centers of one medical center and two regional hospitals in northern Taiwan. Recruitment took place from June 2015 to May 2017.

Inclusion criteria required that family caregivers: (a) were aged 20 years or older—consistent with Taiwan's legal adult age under the Civil Code in effect at the time of the study (prior to the 2023 amendment)—and (b) held primary responsibility for the care of a PLWD. Caregivers were excluded if they had cognitive impairment or a diagnosed psychiatric condition, or if they were non-family caregivers (e.g., paid caregivers residing with the family).PLWD were required to meet the following criteria: (a) have a diagnosis of dementia confirmed by a neurologist or psychiatrist, (b) be aged 65 years or older at the time of diagnosis, and (c) reside in a home setting. PLWD were excluded if they had received a terminal illness diagnosis with an expected prognosis of six months or less (e.g., terminal cancer, kidney failure, heart failure, or chronic obstructive pulmonary disease).

Measures

Caregiver demographic and caregiving characteristics—including age, sex, marital status, education, relationship to the PLWD, caregiving duration, daily caregiving hours, co-residence, status, financial burden, and use of caregiving resources—were collected via a Background Information Form developed by the research team for this study, based on clinical experience with this population. All items were completed by family caregivers via self-report at baseline.

Primary outcomes and covariates were assessed using validated instruments administered at baseline, Year 1, and Year 2 follow-up; the same versions of all instruments were used at each time point without modification. Detailed psychometric properties, item counts, and scoring methods for all scales are summarized in Table 1.

Table 1
Summary of study instruments

Instrument (source)	Domains/ subscales	No. of items	Scoring range	Interpretation	Cronbach's α
Caregivers					
Rewards of Caregiving Scale (FCI)	Being there; Meaning; Learning	14	0–4	Higher = more rewards	.92–.94
Role Strain Scale (FCI)	9 subscales including personal care, illness care, etc.	87	0–4	Higher = greater strain	.97–.98
HRQoL (SF-36)	Physical (PCS); Mental (MCS)	36	0–100	Higher = better HRQoL	.94
Depressive symptoms (CES-D)	General depressive symptomatology	20	0–3	Higher = more symptoms	.92–.94
PLWD					
Cognitive status (MMSE)	Global cognitive function	30	0–30	Higher = better cognitive function	N/A
Dementia severity (CDR)	Global dementia staging	N/A—clinician-rated staging instrument	0, 0.5, 1, 2, 3	Higher = greater dementia severity	N/A
Functional status—ADL (Barthel Index)	Basic self-care and mobility	10	0–100	Higher = greater functional independence	N/A
Functional status—IADL (Lawton IADL Scale)	Complex independent living skills	8	0–8	Lower = greater functional dependency	.80–.94

Note. FCI = Family Caregiving Inventory; HRQoL = health-related quality of life; SF-36 = Short Form-36 Health Survey Questionnaire (measures HRQoL); PCS = Physical Component Summary; MCS = Mental Component Summary; CES-D = Center for Epidemiologic Studies Depression Scale; PLWD = persons living with dementia; MMSE = Mini-Mental State Examination; CDR = Clinical Dementia Rating; ADL = Activities of Daily Living; IADL = Instrumental Activities of Daily Living; N/A entries reflect instruments for which internal consistency is not the applicable metric.

Caregiving rewards were evaluated using the Rewards of Caregiving Scale within the Family Caregiving Inventory (FCI)[17], which measured three distinct domains: *being there*, *meaning*, and *learning*. Role strain was concurrently assessed through one instrument within the FCI: the Role Strain Scale, which comprises 87 items across nine subscales assessing the perceived difficulty of specific caregiving

tasks. The Physical Component Summary (PCS) and Mental Component Summary (MCS) of the Short Form-36 Health Survey Questionnaire (SF-36) [18] were used to evaluate health-related quality of life (HRQoL), and the Center for Epidemiological Studies Depression Scale (CES-D) [19]was employed to determine the frequency and severity of depressive symptomatology.

Regarding the clinical characteristics of the PLWD, dementia type, disease severity as rated by the Clinical Dementia Rating scale (CDR) [20–21] and comorbidities were obtained through chart review of medical records and confirmed by the attending neurologist. Cognitive status was assessed using the Taiwanese version of the Mini-Mental Status Examination (MMSE) [22],The MMSE was administered to PLWD by trained research team members at baseline. The family caregiver reported functional status using two instruments. Basic activities of daily living (ADL) were assessed using the Barthel Index [23], a 10-item caregiver-reported instrument evaluating essential self-care and mobility functions; scores range from 0 to 100, with higher scores indicating greater functional independence. Instrumental activities of daily living (IADL) were assessed using the Lawton IADL Scale [24], an 8-item caregiver-reported instrument evaluating complex independent living skills such as telephone use, shopping, food preparation, and medication management; each item is scored dichotomously (independent = 1, dependent = 0), yielding a summary score from 0 to 8, with lower scores reflecting greater functional dependency.

For the FCI, which lacked a pre-existing Chinese version, a rigorous forward- and back-translation process involving three bilingual nursing experts was applied to ensure linguistic and cultural equivalence. For the other instruments, established, validated Chinese versions were adopted to maintain conceptual integrity.

Procedures

Eligible family caregiver–PLWD dyads were identified through neurologists at the participating clinics and hospital wards. Following initial identification, and with the family caregivers' permission, research assistants contacted potential participants to explain the study objectives, procedures, and the voluntary nature of participation, including the right to withdraw at any time without consequence. Written informed consent was obtained from all participants prior to data collection.

At baseline, family caregivers were provided with a self-administered questionnaire packet to complete at home; research assistants were available to support participants who had difficulty completing the questionnaire independently. Approximately 10 to 15 highly burdened caregivers were unable to complete the baseline measures independently and did so via in-person or telephone interview conducted by a research assistant. Follow-up questionnaires were mailed to participants at one and two years after baseline completion; scheduled telephone reminders were used to encourage response and minimize attrition. The longitudinal follow-up period closed on January 31, 2019. All returned instruments were reviewed for missing values, and longitudinal data were managed using a secure, double-entry database.

Data Analysis

A two-stage analytical approach was used to examine caregiving reward trajectories and their associations with outcomes. In the first stage, group-based trajectory modeling (GBTM) was applied to identify distinct latent subgroups based on the similarity of individuals' longitudinal reward trajectories [25–28]. The sample size of 200 participants at baseline satisfied the minimum threshold of 100 participants for stable GBTM parameter estimation. Trajectory parameters were estimated through maximum likelihood estimation using the following specification (Eq. 1):

$$Y_{iT}^{*g} = \beta_0^g + \beta_1^g Time_{iT} + \epsilon_{iT}^* \mid i = 1, \ldots n$$

Y_{iT}^{*g} is a latent variable representing the underlying reward status of individual *i* at time *T*, given membership in group *g*. Time refers to the interval from the baseline. The coefficients β_0^g and β_1^g represent the intercept and rate of change of a specific caregiving reward within group *g*, respectively. ϵ_{iT}^* is assumed to be normally distributed with a mean of zero and constant variance.

The optimal number of trajectory groups was determined by evaluating multiple fit indices as reported by the statistical software: the Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), and log-likelihood (LL)[29–30]. In the software output used for this study, information criterion values are reported on a scale where less negative values indicate better model fit; this differs in scale from the conventional AIC = -2LL + 2k formulation and should be interpreted accordingly (see Supplemental Table S3). Entropy was used to assess overall classification precision, and the Average Posterior Probability (APP) was evaluated for each group to confirm assignment reliability; APP values exceeding 0.70 indicate high confidence in group membership.

The three-class solution was selected for all three reward domains based on a joint evaluation of statistical fit and clinical utility. The AIC and log-likelihood favored the four-class solution, but this model produced unstable group assignments, with APP values falling below 0.70 for some groups. The two-class solution yielded higher entropy, indicating clearer separation, but lacked sufficient clinical granularity to distinguish meaningfully different reward profiles. The three-class solution provided the optimal balance: APP values ranged from 0.72 to 0.89 across all domains and groups, all exceeding the recommended threshold, while offering clinically interpretable and theoretically coherent trajectory profiles. For the *being there* domain specifically, the BIC difference between the two- and three-class solutions was small (0.63 points); accordingly, the three-class solution for this domain rested primarily on APP values (range 0.81–0.87), entropy, and clinical interpretability rather than BIC improvement alone. Entropy values across the three-class solutions ranged from 0.41 to 0.47, reflecting moderate classification confidence; this is acknowledged as a limitation of trajectory analysis. Within each trajectory group, reward change was modeled as intercept-only, linear, or nonlinear functions of time.

In the second stage, trajectory group membership was used as the sole independent variable in a series of unadjusted generalized estimating equations (GEE) to examine its longitudinal associations with role

strain, depressive symptoms, and HRQoL[31]. A robust estimator and an unstructured working correlation matrix were specified; parameter significance was evaluated using the Wald statistic. A key advantage of GEE is its ability to incorporate partial data from participants who discontinued follow-up, thereby providing robust parameter estimates in the presence of attrition. Missing data were addressed under the Missing at Random (MAR) assumption—that is, the probability of missingness was assumed to relate to observed baseline characteristics rather than to unobserved values. This assumption was supported by the attrition analysis, which showed that while completers and withdrawers differed on certain baseline variables (PLWD gender and lower IADL scores), core sociodemographic and clinical characteristics were largely comparable (see Supplemental Tables S1 and S2). No sensitivity analyses were conducted. All statistical analyses were performed using SAS software, version 9.4.

Results

Participant and Clinical Characteristics

The study included a total of 200 family caregiver-PLWD dyads. Caregivers had a mean age of 54.7 years (*SD* = 10.5); 53.5% were female, and 74.0% were married. The most common caregiver relationships were son (37.0%), daughter (26.5%), and daughter-in-law (18.0%). Nearly half of caregivers had completed college or above (49.0%), and the majority co-resided with the PLWD (77.0%). Mean daily caregiving time was 8.06 hours (*SD* = 7.48; median = 5.00, IQR = 10.00), and mean caregiving duration was 67.78 months (*SD* = 64.61; median = 58.00, IQR = 55.00); both distributions were right-skewed. Most caregivers reported having help available from others (84.0%), and 55.0% reported at least one comorbidity. Full baseline caregiver characteristics are presented in Tables 2 and 3.

Table 2

*Baseline demographic and clinical characteristics of family caregivers (*N *= 200)*

Variable	**Value**
Age, *M* (*SD*) [a]	54.7 (10.5)
Gender, *n* (%)	
Male	93 (46.5)
Female	107 (53.5)
Marital status, *n* (%) [b]	
Married	148 (74.4)
Unmarried	34 (17.1)
Divorced	8 (4.0)
Widowed	7 (3.5)
Cohabiting	2 (1.0)
Education level, *n* (%) [b]	
Elementary school	19 (9.5)
Junior high school	22 (11.0)
Senior high school	60 (30.2)
College and above	98 (49.2)
Relationship to PLWD, *n* (%)	
Spouse	34 (17)
Son	74 (37)
Daughter	53 (26.5)
Daughter-in-law	36 (18)
Son-in-law	1 (0.5)
Other	2 (1)
Comorbidities, *n* (%) [c]	110 (55.0)
Heart disease	17 (8.5)
Cancer	5 (2.5)
Stroke	3 (1.5)

Variable	Value
Arthritis	25 (12.5)
Diabetes	14 (7.0)
Hypertension	40 (20.0)
Other disease	50 (25.0)

Table 3

*Baseline caregiving characteristics of family caregivers (*N *= 200)*

Variable	**Value**
Lives with PLWD, *n* (%)	
Yes	154 (77.0)
No	36 (18.0)
Other	10 (5.0)
Daily caregiving time (hours/day), *M* (*SD*) [a]	8.06 (7.48)
Median (IQR)	5.00 (10.00)
Caregiving duration (months), *M* (*SD*) [b]	67.78 (64.61)
Median (IQR)	58.00 (55.00)
Has available help from others, *n* (%)	
Yes	168 (84.0)
No	32 (16.0)
Primary co-caregiver support, *n* (%)	
None	39 (19.5)
Siblings	60 (30.0)
Foreign caregiver	50 (25.0)
National caregiver	5 (2.5)
Other	46 (23.0)
Perceived support from siblings/other relatives, *n* (%) [c]	
None	41 (20.6)
A little	41 (20.6)
Some	45 (22.6)
A lot	44 (22.1)
More than enough	28 (14.1)
Uses caregiving resources, *n* (%)	
Yes	54 (27.1)
No	146 (73.0)

Variable	Value
Employs a paid assistant, *n* (%) [d]	
Yes	79 (39.9)
No	119 (60.1)
Financial burden, *n* (%) [e]	
None	69 (35.0)
A little	43 (21.8)
Some	34 (17.3)
A lot	40 (20.3)
Staggering	11 (5.6)

PLWDs had a mean age of 81.0 years (*SD* = 6.4, range: 65–95 years) and were predominantly female (71.0%). The most common diagnosis was Alzheimer's disease (60.6%), and most PLWDs had moderate dementia severity (CDR = 1; 45.2%). Mean MMSE score was 12.21 (*SD* = 6.36). Full baseline characteristics of PLWDs are presented in Table 4.

Table 4

*Baseline demographic and clinical characteristics of persons living with dementia (*N *= 200)*

Variable	**Value**
Age, *M* (*SD*)	81 (6.4)
Gender, *n* (%)	
Male	58 (29.0)
Female	142 (71.0)
Marital status, *n* (%)	
Married	85 (42.5)
Widowed	110 (55.0)
Divorced	5 (2.5)
Education level, *n* (%) [a]	
Elementary school	142 (71.0)
Junior high school	19 (9.5)
Senior high school	15 (7.5)
College and above	12 (6.0)
Other	11 (5.5)
Clinical status	
Dementia type, *n* (%) [b]	
AD	120 (60.6)
VAD	39 (19.7)
MIX	24 (12.1)
Other	15 (7.6)
Cognitive status (MMSE, range = 0–30), *M* (*SD*) [c]	12.21 (6.36)
CDR score, *n* (%) [d]	
0.5	41 (20.6)
1	90 (45.2)
2	51 (25.6)
3	16 (8.0)

Variable	Value
4	1 (0.5)
ADL score, *M* (*SD*) [b]	70.94 (33.52)
IADL score, *M* (*SD*) [e]	1.5 (1.83)
Comorbidities, *n* (%) [f]	110 (55.0)
Heart disease	53 (26.5)
Cancer	9 (4.5)
Stroke	23 (11.5)
Parkinson's disease	24 (12.0)
Arthritis	38 (19.0)
Diabetes	55 (27.5)
Hypertension	94 (47.0)
Other disease	36 (18.0)
Note. AD = Alzheimer's disease; VAD = vascular dementia; MIX = mixed dementia; MMSE = Mini-Mental State Examination; CDR = Clinical Dementia Rating; ADL = activities of daily living; IADL = instrumental activities of daily living.	
[a] *n* = 199 for this variable (1 missing response).	
[b] *n* = 198 for this variable (2 missing responses).	
[c] *n* = 194 for this variable (6 missing responses).	
[d] *n* = 199 for this variable (1 missing response).	
[e] *n* = 197 for this variable (3 missing responses).	
[f] Comorbidity subtypes are not mutually exclusive; percentages are of the total sample.	

Participant Flow and Attrition

A total of 257 caregiver-PLWD dyads were approached and screened for eligibility, of whom 200 met the inclusion criteria and were enrolled at baseline (Fig. 1). Of the 200 enrolled participants, 145 completed the Year 1 follow-up; 112 completed the Year 2 follow-up and were included in the longitudinal analysis. Fifty-five participants did not complete Year 1 (death of the PLWD, *n* = 17; refusal, *n* = 33; lost to follow-up, *n* = 2; nursing home admission, *n* = 3). An additional 33 participants did not complete Year 2 (death of the

PLWD, *n* = 11; refusal, *n* = 17; lost to follow-up, *n* = 4; nursing home admission, *n* = 1), resulting in a total of 88 participants who did not complete the two-year follow-up.

An attrition analysis was conducted to compare the baseline characteristics of study completers (*n* = 112) and withdrawers (*n* = 88). As detailed in Supplemental Table S1, no significant differences were found in demographic or caregiving characteristics of caregivers who completed or withdrew from the study (all $p > .05$). Similarly, Supplemental Table S2 shows that, among PLWD, nearly all demographic and clinical characteristics were comparable between groups; however, withdrawers were significantly more likely to involve female PLWD ($p = .01$) and those with lower baseline IADL scores ($p = .01$). Despite these differences, core sociodemographic and clinical characteristics were largely comparable at baseline. As described in Section 2.6, these findings supported the use of generalized estimating equations (GEE) under the MAR assumption.

Mean follow-up duration among study completers was 26.76 months (*SD* = 4.00; range: 14.86–43.36 months). Among participants who withdrew during the second year (*n* = 33), mean follow-up duration before withdrawal was 15.00 months (*SD* = 3.22; range: 9.96–24.06 months). Follow-up duration was not recorded for participants who withdrew during the first year (*n* = 55).

Trajectory Identification and Fit Statistics

The selection of the optimal number of trajectory groups was guided by model fit statistics presented in Supplemental Table S3. For all three reward domains (*being there*, *meaning*, and *learning*), a three-class solution was selected as the best fit. As described in Section 2.6, the information criterion values reported by the software differ in scale from conventional formulations; in this software's output, less negative values indicate better fit. Taken together with the AIC and log-likelihood values, the three-class solution was supported by average posterior probability (APP) values ranging from 0.72 to 0.89 across all domains and groups, all exceeding the recommended threshold of 0.70, while offering clinically interpretable trajectory profiles.

Trajectories of Caregiving Rewards

Three distinct trajectories—characterized by consistently high, medium, and low levels—were identified for each caregiving reward (Table 5 and Fig. 2). Group sizes and proportions for each reward domain are presented in Table 5. Notably, the high *being there* group was the smallest across all domains 11.0% (*n* = 22). In the *learning* reward domain, both the low- and high-reward groups showed significant linear upward trends over time ($p = .01$). The low-reward group showed a more pronounced rate of increase from baseline to the 2-year follow-up. Trajectories for *being there* and *meaning* remained stable across all groups ($p > .05$).

Table 5

*Trajectories of specific family caregiver rewards over time (*N *= 200)*

Group	Being there	*p*	Meaning	*p*	Learning	*p*
	***n* (%)**		***n* (%)**		***n* (%)**	
Low	65 (32.5)	.35	30 (15.0)	.38	57 (28.5)	.01*
Medium	113 (56.5)	.49	130 (65.0)	.37	96 (48.0)	.56
High	22 (11.0)	.78	40 (20.0)	.10	47 (23.5)	.01*

Note. *p*-values indicate the significance of linear slope changes over time in each trajectory group, based on group-based trajectory modeling (GBTM).

*$p < .05$.

Associations Between Reward Trajectories and Caregiver Outcomes

Summary statistics for outcome variables at each time point are presented in Table 6. Item-level missingness for each outcome variable by trajectory group and time point is presented in Supplemental Tables S4-1 through S4-3. Among caregivers, mean levels of depressive symptoms increased modestly over time (baseline: *M* = 12.74, *SD* = 11.18; Year 1: *M* = 13.18, *SD* = 11.08; Year 2: *M* = 14.88, *SD* = 11.48), whereas role strain, physical health, and mental health remained relatively stable across the three time points (Table 6).

Table 6

*Descriptive statistics for family caregiver outcome variables across three time points (*N *= 200)*

Variable	Baseline		Year 1		Year 2	
	n	***M* (*SD*)**	***n***	***M* (*SD*)**	***n***	***M* (*SD*)**
CES-D	191	12.74 (11.18)	135	13.18 (11.08)	111 [a]	14.88 (11.48)
Role strain	199	0.90 (0.72)	145	1.02 (0.69)	112	0.97 (0.75)
PCS	180	50.41 (9.30)	140	50.22 (9.88)	111 [a]	50.04 (9.55)
MCS	180	49.85 (10.27)	140	50.01 (10.30)	111 [a]	49.88 (10.22)

Note. CES-D = Center for Epidemiologic Studies Depression Scale; PCS = Physical Component Summary of the Short Form-36 Health Survey Questionnaire; MCS = Mental Component Summary of the Short Form-36.

[a] One participant completed the Year 2 follow-up but did not complete this measure at that time point; *n* = 111 reflects item-level missingness rather than participant dropout.

As shown in Table 7, with the low-reward group as the reference, higher reward levels were associated with significantly better outcomes across multiple domains. For *being there*, the high-reward group was associated with lower role strain (β = -0.27, 95% CI [-0.52, -0.02], p = .039) and better mental health (β = 4.45, 95% CI [0.33, 8.57], p = .034) compared with the low-reward group. In the *meaning* domain, the high-reward group was associated with fewer depressive symptoms (β = -10.1, 95% CI [-15.31, -4.89], p < .001), lower role strain (β = -0.52, 95% CI [-0.83, -0.21], p = .001), and better physical (β = 5.92, 95% CI [1.14, 10.70], p = .015) and mental health (β = 11.28, 95% CI [6.89, 15.67], p < .001). The medium-reward group for *meaning* also showed significant associations with fewer depressive symptoms (β = -7.05, 95% CI [-11.75, -2.35], p = .003), lower role strain (β = -0.32, 95% CI [-0.61, -0.03], p = .025), better physical health (β = 5.83, 95% CI [1.75, 9.91], p = .005), and better mental health (β = 6.37, 95% CI [2.47, 10.27], p = .01).

Table 7

*Generalized estimating equations (GEE) analysis showing longitudinal associations between caregiver rewards and caregiver outcomes (*N = *200)*

Variable and reward group	CES-D		Role strain		PCS		MCS	
	***β* (95% CI)**	***p***	***β* (95% CI)**	***p***	***β* (95% CI)**	***p***	***β* (95% CI)**	***p***
Being there								
High	-2.92 (-7.70, 1.86)	.231	-0.27 (-0.52, -0.02)	.039*	0.73 (-3.84, 5.30)	.753	4.45 (0.33, 8.57)	.034*
Medium	-1.60 (-4.58, 1.38)	.292	0.01 (-0.19, 0.21)	.930	1.98 (-0.82, 4.78)	.166	2.23 (-0.53, 4.99)	.113
Meaning								
High	-10.10 (-15.31, -4.89)	< .001***	-0.52 (-0.83, -0.21)	.001**	5.92 (1.14, 10.70)	.015*	11.28 (6.89, 15.67)	< .001***
Medium	-7.05 (-11.75, -2.35)	.003**	-0.32 (-0.61, -0.03)	.025*	5.83 (1.75, 9.91)	.005**	6.37 (2.47, 10.27)	.01*
Learning								
High	-4.90 (-8.84, -0.96)	.014*	-0.39 (-0.63, -0.15)	.001**	2.17 (-1.50, 5.84)	.245	7.66 (4.07, 11.25)	< .001***
Medium	-3.50 (-6.77, -0.23)	.035*	-0.24 (-0.46, -0.02)	.027*	1.77 (-1.33, 4.87)	.261	4.26 (1.42, 7.10)	.003**

Note. CES-D = Center for Epidemiologic Studies Depression Scale; PCS = Physical Component Summary of the Short Form-36 Health Survey Questionnaire; MCS = Mental Component Summary of the Short Form-36; High = high-reward group; Medium = medium-reward group. The low-reward group served as the reference group for the analysis.

*$p < .05$.

**$p < .01$.

***$p < .001$.

In the *learning* domain, the high-reward group was associated with fewer depressive symptoms (β = -4.90, 95% CI [-8.84, -0.96], p = .014), lower role strain (β = -0.39, 95% CI [-0.63, -0.15], p = .001), and better mental health (β = 7.66, 95% CI [4.07, 11.25], p < .001). The medium-reward group for *learning* showed significant associations with fewer depressive symptoms (β = -3.50, 95% CI [-6.77, -0.23], p = .035), lower

role strain (β = -0.24, 95% CI [-0.46, -0.02], p = .027), and better mental health (β = 4.26, 95% CI [1.42, 7.10], p = .003). Full results are presented in Table 7.

Discussion

To our knowledge, this is the first study to examine longitudinal trajectories of three distinct caregiving rewards—*being there*, *meaning*, and *learning*—among family caregivers of PLWD. Rather than confirming the hypothesized binary classification, three distinct subgroups emerged for each reward domain. The emergence of a medium-reward group alongside high and low groups suggests that positive adaptation to caregiving is more finely graded than a simple binary would capture, and that a meaningful proportion of caregivers may follow a path of moderate, sustained reward rather than falling at either extreme.

In contrast, the *learning* reward exhibited a unique pattern, where a larger proportion of family caregivers followed a high *learning* reward trajectory. As illustrated in Fig. 2, a distinct subgroup demonstrated a significant linear increase in *learning* rewards over time, reflecting an accumulation of caregiving competence and preparedness. This pattern aligns with theories of caregiver preparedness and competence-building: Caregivers who entered the study with limited mastery had the most ground to gain, and their steeper rate of increase suggests that learning-oriented rewards accumulate in response to ongoing experience [32–33].

Differentiation between reward types observed in our findings aligns with and extends existing literature [7]. Conceptually, the three reward domains correspond to key dimensions identified in prior research: *Being there* reflects mutuality, *meaning* reflects finding purpose, and *learning* reflects personal growth [7]. Although *learning* evolved dynamically, the rewards of *being there* (mutuality) and *meaning* (existential purpose) remained relatively stable throughout the longitudinal course. One possible explanation is that family caregivers often started off feeling unprepared, but as they acquired knowledge and skills over time, their sense of accomplishment grew. This interpretation aligns with evidence that better preparedness is associated with increases in caregiving rewards, particularly learning [32–33]. In many Asian contexts, filial norms establish a durable sense of obligation and relational closeness toward the care recipient. This baseline orientation may sustain both the feeling of being present for the PLWD and the sense of purpose, even as dementia progresses and demands intensify. The stability of *being there* and *meaning* across the two-year follow-up may reflect this cultural anchoring.

Importantly, this study demonstrated that higher perceived rewards were associated with better family caregiver outcomes, though the strength of these links varied by reward type. These findings are consistent with prior cross-sectional research showing that greater positive caregiving appraisals (or rewards) are associated with lower caregiver burden and better well-being [34]. Furthermore, our results suggest a possible threshold effect, where robust health benefits—particularly for physical well-being—were most pronounced when rewards reached a high level.

In the domains of *meaning* and *learning*, family caregivers in the high-reward group showed robust mental health advantages, whereas those with moderate rewards had more limited benefits. Notably, a

high sense of *meaning* was the most broadly beneficial, being associated not only with less psychological distress but also with better physical health, an association that was significant even for the moderate *meaning* group. This implies that finding personal meaning may have a tangible impact on a family caregiver's physical well-being, possibly by buffering the physiological effects of stress. In contrast, *being there* (mutuality) was not significantly related to depression levels or physical health outcomes unless it was very high.

These findings have direct implications for clinical practice. Recent systematic evidence confirms that positive aspects of caregiving buffer against caregiving stress [34] ; the present results extend that evidence by showing that reward type and trajectory level may both matter for outcomes. Healthcare providers should consider routinely assessing for *being there*, *meaning*, and *learning* as distinct dimensions, since caregivers identified as following persistently low-reward trajectories—particularly in *meaning* and *learning*—may benefit most from early targeted support before downstream outcomes, such as depression or role strain, emerge. For the *meaning* domain, positive psychology interventions such as benefit-finding exercises can empower caregivers to identify personal growth and existential purpose within the caregiving role [35]. For the *learning* domain, structured psychoeducational preparedness programs are well-supported mechanisms for building caregiving competence over time [32]. Strengthening the *being there* domain may further be addressed through communication training that affirms the caregiver-care recipient bond. Together, these approaches represent a shift from burden reduction toward the active cultivation of specific rewards, consistent with calls for strengths-based dementia care [35–36]. At the policy level, these findings support integrating reward-based assessments into formal care records as a tool for identifying at-risk families early. More broadly, fostering caregiving rewards may enhance the psychological sustainability of caregivers in their role over time—strengthening long-term resilience and reducing the risk of burnout across the prolonged course of dementia.

Limitations

This study has several limitations. First, the sample was recruited from neurology clinics at a single medical center in northern Taiwan using convenience sampling, and data were collected between 2015 and 2019. Participants were predominantly caregivers already engaged with formal healthcare services, which may limit the generalizability of the findings to caregivers in community or rural settings with limited healthcare contact. Furthermore, the strong filial piety norms characteristic of East Asian societies likely shaped how family caregivers perceived and expressed caregiving rewards, suggesting that trajectory patterns may differ in other cultural contexts.

Second, the study had a substantial attrition rate over the two-year follow-up period. Analysis of withdrawers indicated that the loss of participants was not entirely random; instead, it occurred more frequently among individuals caring for PLWD with more significant impairments in IADL. This pattern suggested that attrition was linked to specific clinical and relationship factors. Although GEE was used to provide robust estimates under the assumption that missingness was related to observed

characteristics, a “survivor bias” potentially remains. The remaining sample likely represented relatively more stable caregiving environments, which may have led to a possible overestimation of reward stability among the most burdened family caregivers. Additionally, the GEE models were unadjusted; potential confounders such as caregiver age, relationship to the PLWD, and disease severity were not controlled for, and the observed associations between reward trajectories and outcomes should be interpreted accordingly. Additionally, follow-up duration was not recorded for participants who withdrew during the first year of the study (*n* = 55), precluding a complete characterization of attrition timing across the full sample.

Third, although sample size was adequate for trajectory modeling, the small number of family caregivers in the high-reward subgroups limited the statistical power to detect finer differences across trajectories. Entropy values across the three-class solutions ranged from 0.41 to 0.47, reflecting moderate classification confidence, which is an acknowledged limitation of trajectory analysis. Finally, all measures relied on self-report instruments, which are susceptible to social desirability and mood-related reporting bias. Future studies should recruit larger, more diverse samples and incorporate objective health data, such as medical records or biomarkers, to further enhance the validity of the findings.

Conclusion

This study identified three distinct trajectory patterns—high, medium, and low—for each of three specific caregiving rewards: *being there, meaning*, and *learning*, providing support for the first hypothesis. Among these, the trajectory of *learning* rewards demonstrated a unique and significant increase over time—particularly for family caregivers initially reporting low levels of reward—suggesting that caregiving-related learning may accumulate with time and experience. Consistent with the second hypothesis, membership in higher-reward trajectory groups was associated with better psychological outcomes, including fewer depressive symptoms and lower role strain, across the *meaning* and *learning* domains. Notably, the high *meaning* reward group was the only group associated with better physical health, while *being there* rewards showed more limited associations with outcomes. These findings suggest that caregiving rewards are differentially associated with caregiver well-being and that learning-related rewards may be dynamic and responsive to caregiving experience. Given the study’s convenience sample, unadjusted models, and moderate trajectory classification confidence, these results should be interpreted cautiously and replicated in larger, more diverse populations.

Abbreviations

AD
Alzheimer's disease
ADL
Activities of Daily Living
AIC
Akaike Information Criterion

APP
Average Posterior Probability
BIC
Bayesian Information Criterion
CDR
Clinical Dementia Rating
CES-D
Center for Epidemiologic Studies Depression Scale
FCI
Family Caregiving Inventory
GBTM
Group-Based Trajectory Modeling
GEE
Generalized Estimating Equations
HRQoL
Health-Related Quality of Life
IADL
Instrumental Activities of Daily Living
IQR
Interquartile Range
LL
Log-Likelihood
MAR
Missing at Random
MCS
Mental Component Summary
MIX
Mixed dementia
MMSE
Mini-Mental State Examination
MOHW
Ministry of Health and Welfare
PAC
Positive Aspects of Caregiving
PCS
Physical Component Summary
PLWD
Persons Living with Dementia
SAS
SAS software

SF-36
Short Form-36 Health Survey Questionnaire
VAD
Vascular dementia

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of the Chang Gung Medical Foundation (No. 100-3644B). All methods were performed in accordance with the relevant guidelines and regulations. Written informed consent was obtained from all individual participants included in the study.

Consent for publication

Not applicable

Competing interests

The authors declare no competing interests

Note

PLWD = persons living with dementia.

Note

PLWD = persons living with dementia.

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Author Contribution

Y.H.C. and Y.I.L.S. conceived and designed the study. Y.H.C. and W.C.H. were responsible for data collection and investigation. Material preparation and data analysis were performed by Y.H.C. and Y.K.L. The first draft of the manuscript was written by Y.H.C., and all authors (Y.H.C., Y.I.L.S., Y.K.L., and W.C.H.) commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data Availability

The de-identified dataset supporting the findings of this study is available from the corresponding author (Yea-Ing L. Shyu, yeaing@mail.cgu.edu.tw) upon reasonable request, subject to ethical approvals, Institutional Review Board guidelines, and privacy restrictions.

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Figures

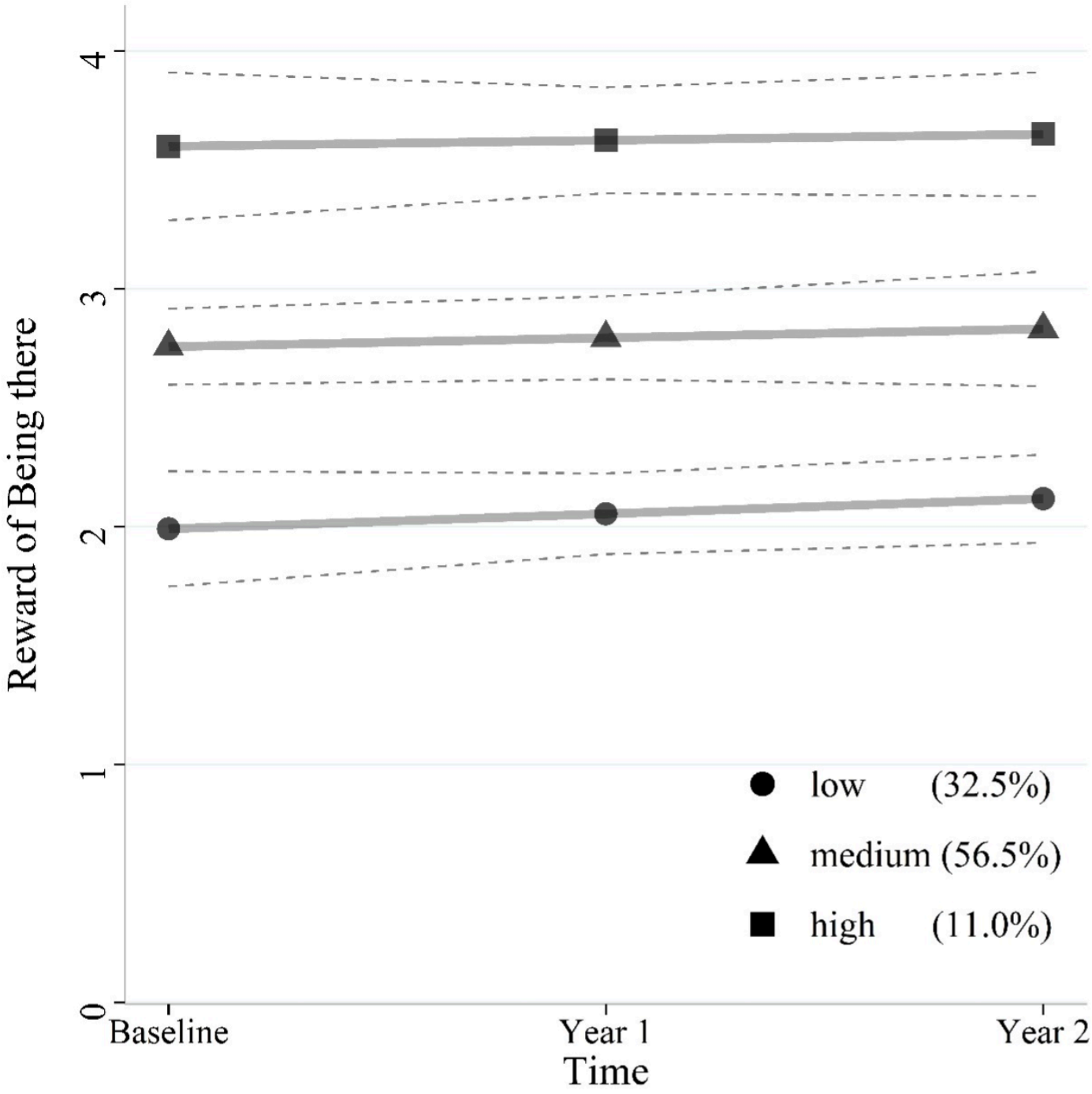


Figure 1

Enrollment, follow-up, and attrition of family caregiver–PLWD dyads across the two-year study period

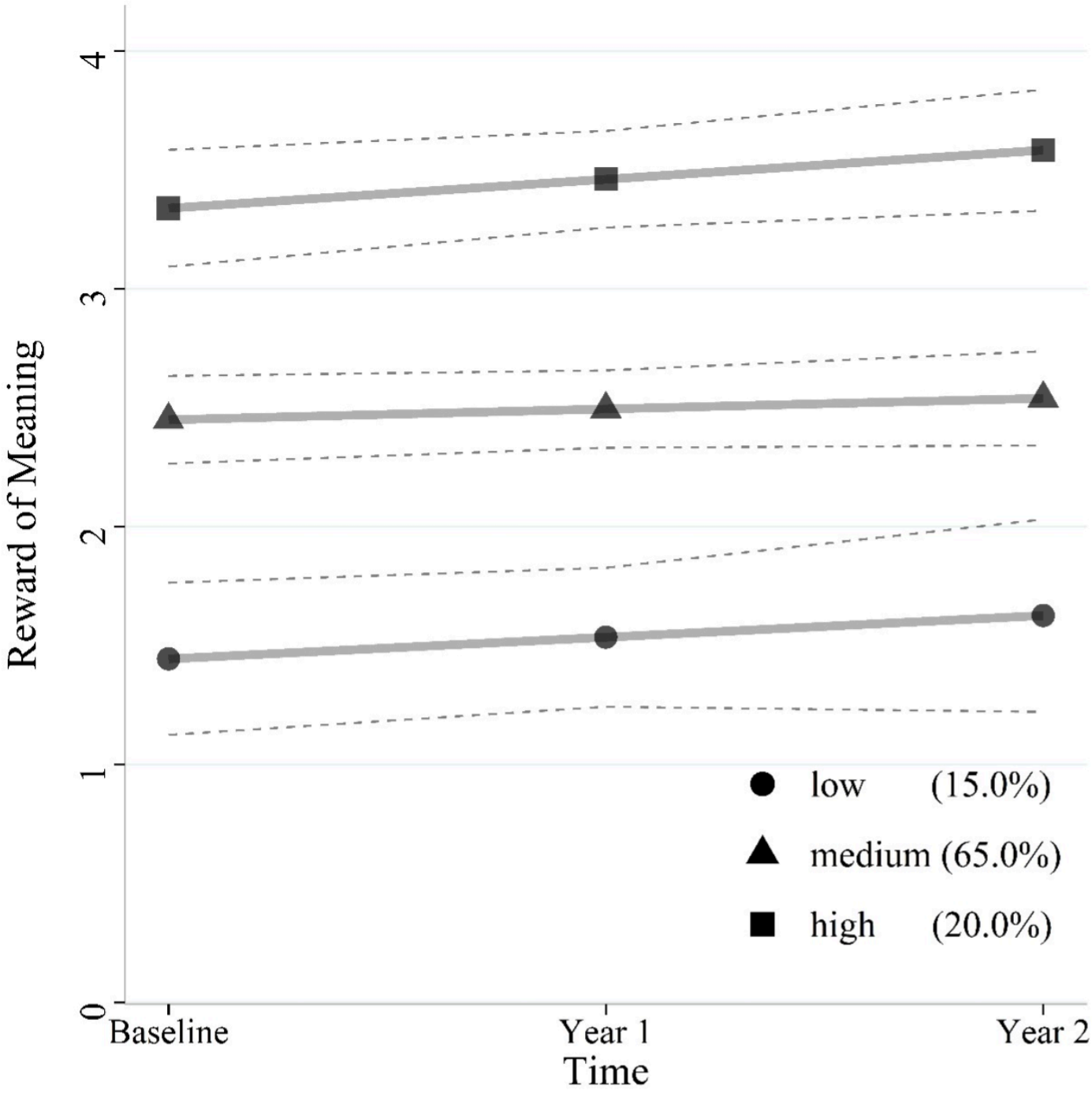


Figure 2

Trajectories of specific family caregiver rewards (being there, meaning, and learning) over two years

Supplementary Files

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- SupplementalTables.docx